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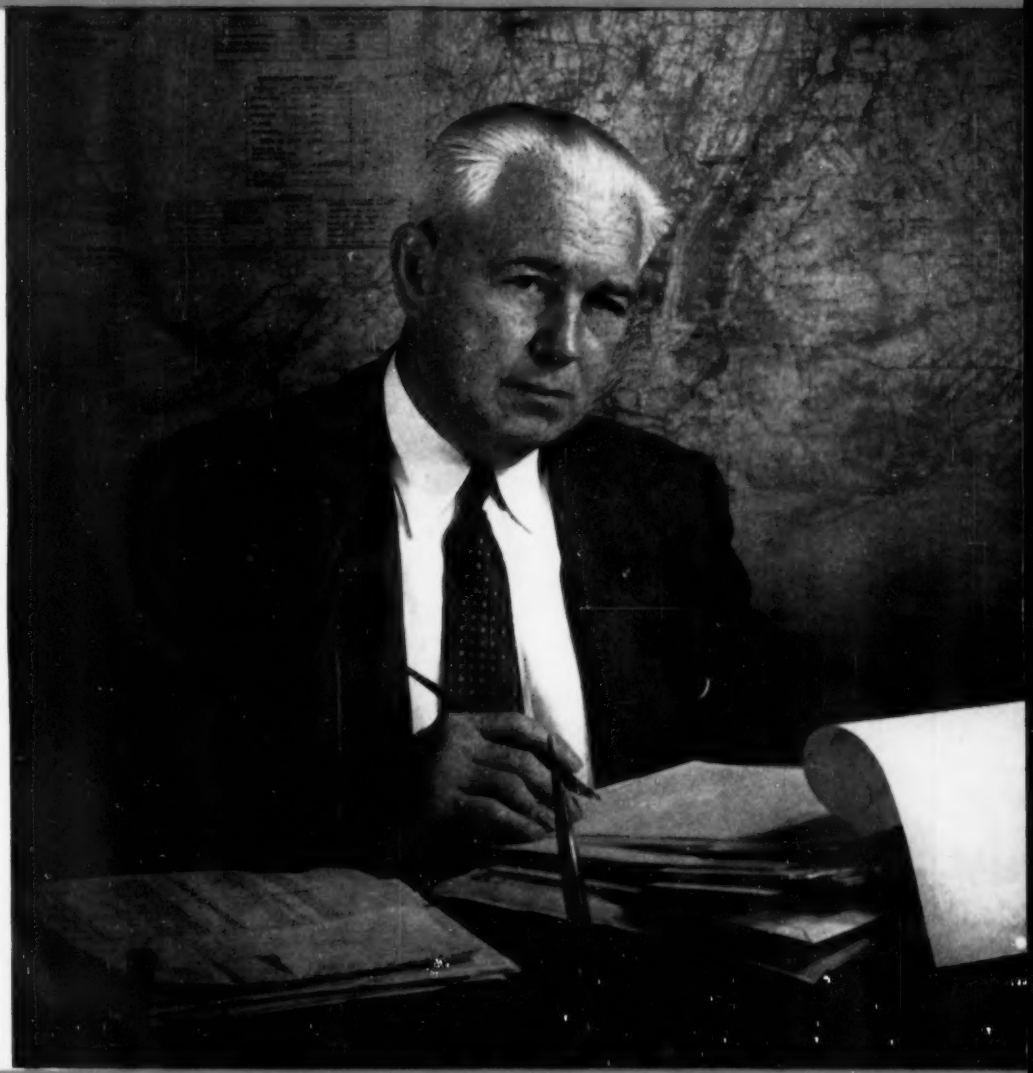


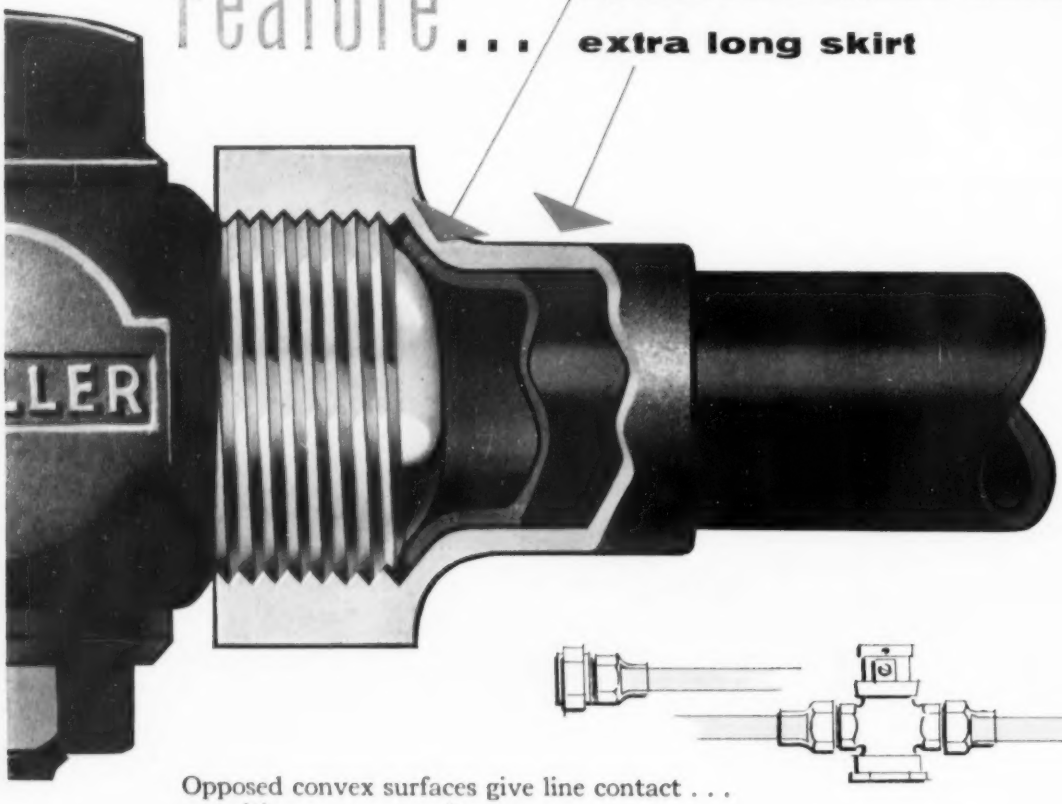
Edward J. Clark is Chief Engineer of the Bureau of Water Supply of New York City and, as such, is responsible for the safe delivery of more than a billion gallons of water every day to the city. More about him on page 26.

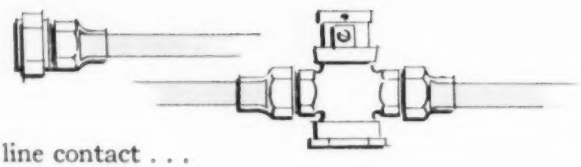
MUELLER

COPPER CONNECTIONS

feature . . . **opposed convex surfaces**

extra long skirt





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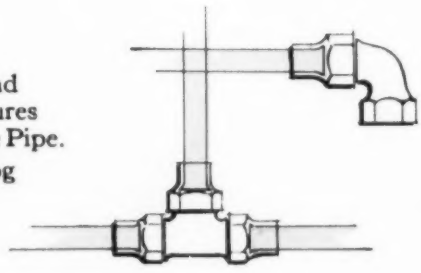

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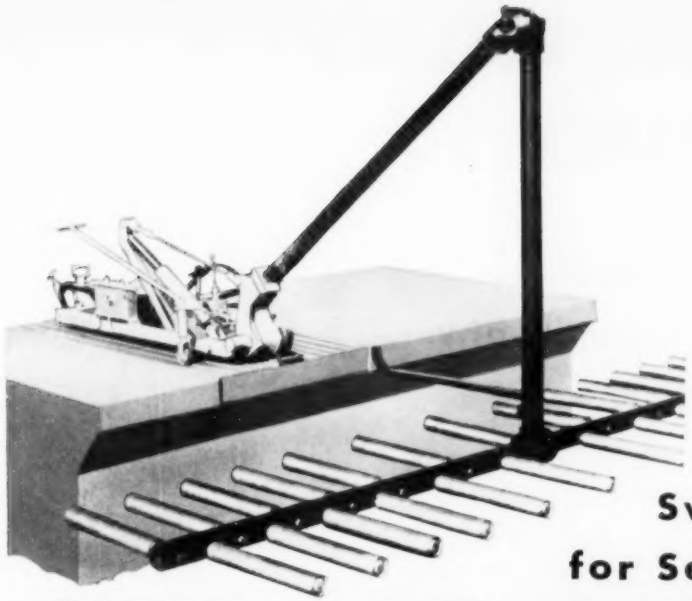

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Chicago Swing Diffusers offer all sizes of treatment plants—both industrial and municipal—the advantages of air diffusing apparatus that is always in operation at maximum efficiency.

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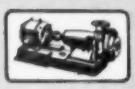

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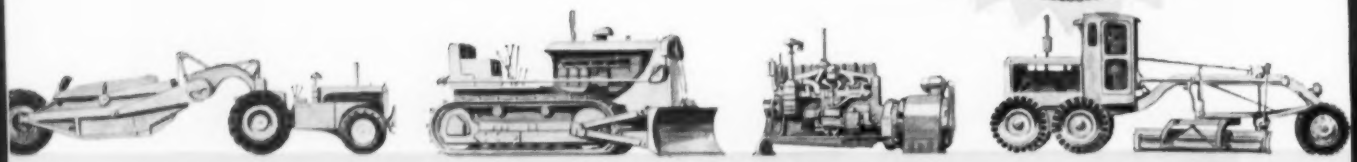

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PUBLIC WORKS MAGAZINE

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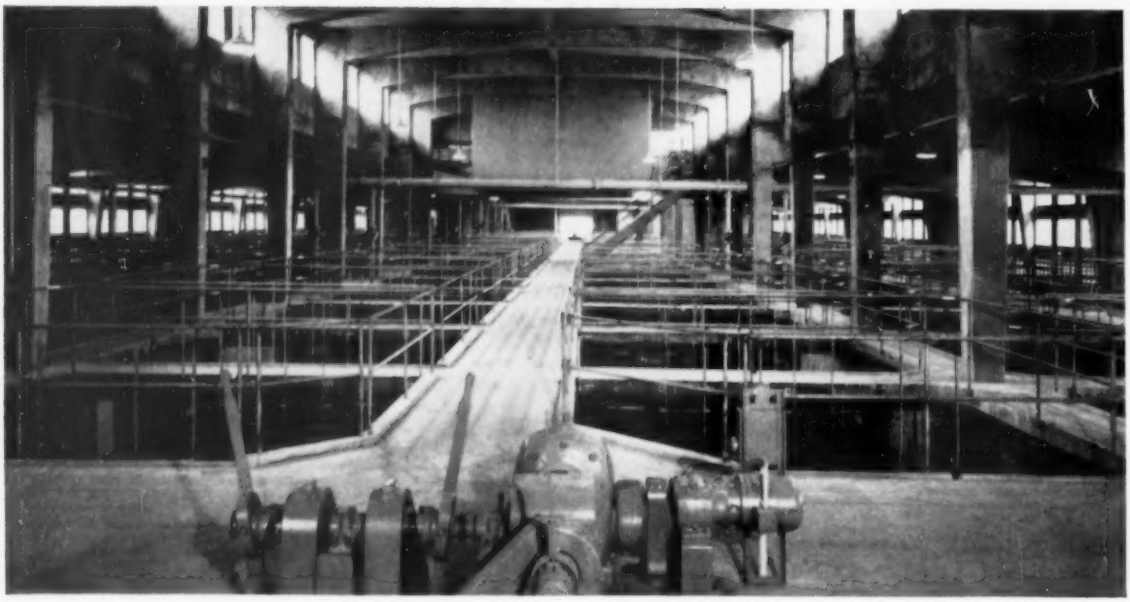
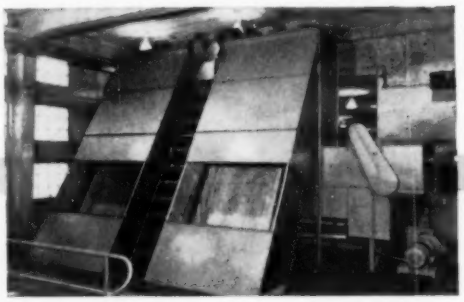
THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES



At North Point plant, opened in 1951, three of the six pre-aeration settling tanks—each equipped with two Link-Belt Straightline longitudinal sludge collectors and one cross collector—are shown above. By combining pre-aeration and settling in the same tank, system cuts construction costs, improves efficiency. Two Link-Belt mechanically cleaned bar screens (right) remove large solids at Southeast treatment plant. Sludge from here and that pumped six miles from North Point are both treated at the new Southeast sludge plant.



San Francisco gets a clean water front

Pre-aeration and LINK-BELT equipment provide top efficiency, low cost at two new sewage plants

After 100 years of discharging raw sewage into the Bay and the Pacific, San Francisco built its first treatment plant in 1939. This Richmond-Sunset Works was equipped with Link-Belt grit and sludge collectors, bar screens, mixers, gates and conveyors.

So satisfactory was the Link-Belt equipment's performance that, when two new sewage treatment plants were planned, San Francisco again relied on Link-Belt. In the three plants, Link-Belt equipment helps treat an average design flow of 110 mgd, with a peak capacity of 260 mgd.

If you're planning new sewage, water or industrial waste treatment facilities—or the enlarging of existing capacity—find out how Link-Belt's broad line of quality equipment can serve you. Our engineers will work with you, your chemists and consultants—help you get top efficiency at lowest overall cost.

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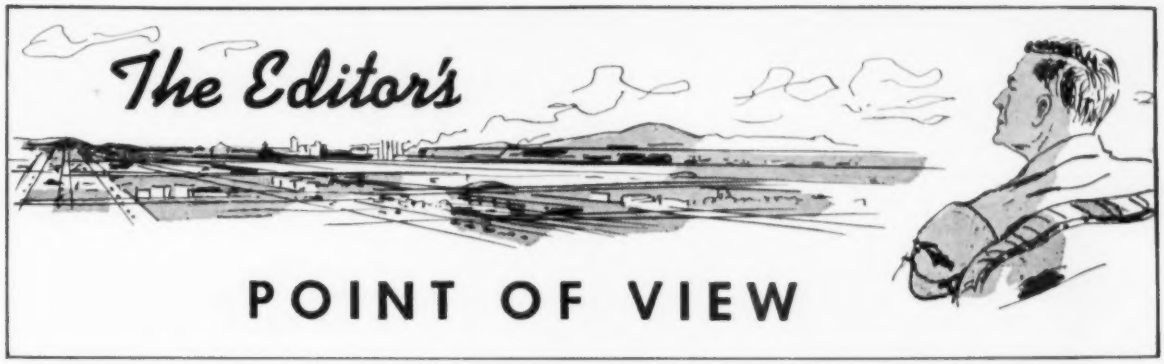


Christmas Greetings to Our Readers

MERRY CHRISTMAS to all PUBLIC WORKS readers. We hope the year now ending was a good one for you and that you will find in the coming holidays additional happiness and pleasure, and lots of interesting and rewarding work in the year to come.

Getting Income from Municipal Refuse May Now Be Possible

IT has always been the dream of the perfectionist, and often of the engineer, that municipal wastes should pay their way. Composting has attracted much interest because of this possibility; but now it seems that incineration can provide that long-sought income to the city. Part of this stems from the changing character of refuse. To put it graphically, if not entirely accurately, there are fewer heat-demanding and more heat-producing components, in municipal refuse. This is due to the greater use of frozen foods, to home garbage grinders, and to other generally similar causes. As a result, it seems entirely possible to produce enough power from an incinerator eventually to pay for the plant, and maybe to reduce the cost of collection as well.

Forward-looking cities are working along these lines. We believe they will succeed; and success may do more than any agency has hitherto accomplished in prompt, complete and sanitary collection of refuse. If waste can be made to produce an income, then modern collection equipment will be a necessity. A new interest will be created in municipal officials and the spirit of business enterprise will give an impetus to the sense of civic duty.

Engineers Need Precision in Writing as Well as in Designing

BACK in our college days we were told we ought to study German because it was a much more precise language than English. It may be; we really didn't learn enough about it to know. But, in the years as an editor we have learned a lot about the troubles that so many engineers have in saying exactly what they mean. Other scientific men have this difficulty, too. For instance, consider the familiar weather forecast: "Widely scattered showers." Does this mean that there will be lots of showers covering a wide area; or does it mean the showers will be scattered far and wide with lots of space between each one?

Precision in speaking and writing is necessary for engineers. There is no quick and easy way to attain this objective. Proper high school and college training will help. Aside from that, the bootstrap lifting procedure is about the only way left. Let that speech or report lay over till the end of the week and then go over it questioning each statement: "What did I intend to say; is it clear; and can it be interpreted in more ways than one?" Boy, bring on the pencils and make sure they have erasers.

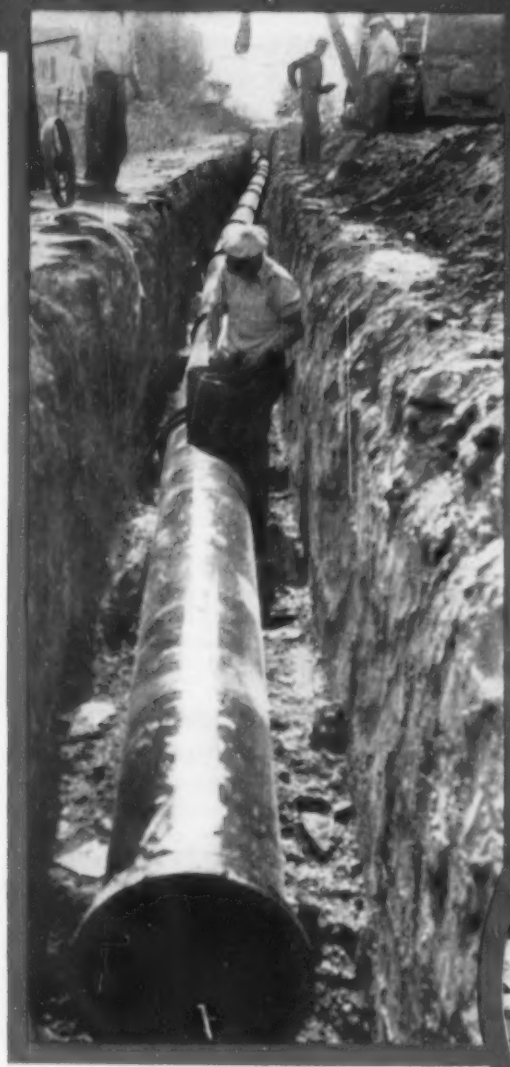
No Matter How Thin You Slice it . . .

BALONEY is the term that comes to our mind when we hear engineers who ought to know better telling younger engineers that they should do nothing that could be construed as trying to better their status; and that is one of the milder terms. Why shouldn't engineers do everything they can, ethically, honestly and properly, to gain prestige, standing and salary? Why should this be left to other professional groups, with engineers usually at the low end of the salary scale and about the same in popular standing and influence?

We listened to some of this baloney during the recent fall spate of conventions. Engineers will never attain the status that is rightfully theirs if they take this sort of advice, sit back in a remote corner and wait for people to come bringing them garlands and salary increases. Possession of a reasonable degree of ambition and desire to get ahead made this country great. Engineers are as much entitled to get ahead as any other honest, conscientious, trained and capable citizens. Engineering would be better off if some of these self-evident truths were taught in colleges in a straightforward and honest way. One needn't be ashamed to draw a good salary nor of being looked up to as a leader in his community and his profession.

As the saying is: No matter how thin you slice it, it's still baloney.

For TOUGH assignments



When pipe is to be installed under conditions which make repairs difficult at best, the engineering profession relies on cast iron pipe. Such installations, for example, as outfall sewers, river crossings, and sealed piping in sewage treatment and water filtration plants. *Any* installation, where repairs should be a remote possibility, calls for rugged cast iron pipe. Its great beam-strength, compressive-strength and shock-strength—plus its effective resistance to corrosion—result in long life with negligible repairs and maintenance cost. For information write: Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.

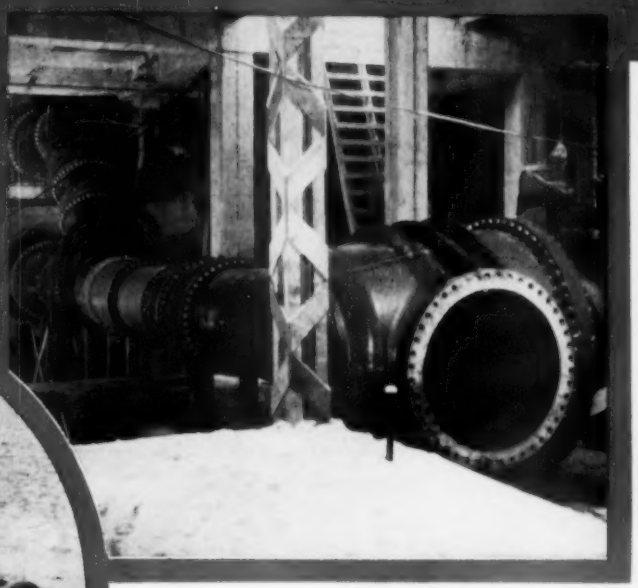
(above)
Installing cast iron belt feeder main for water supply system in Casper, Wyoming.

(right)
Cast iron pipe for discharge lines from water circulating pump house in a midwest oil refinery.

CAST IRON PIPE

Now's the time to mail this month's Readers' Service card.

use this RUGGED pipe



(above)
Cast iron pipe for outfall into St. Joseph Sound from sewage disposal plant at Dunedin, Fla.

(top right)
Cast iron pipe and fittings installed in world's largest water filtration plant in Chicago, Ill.

(at right)
Installing 30" cast iron pipe for sewage treatment plant at Panama City, Fla.

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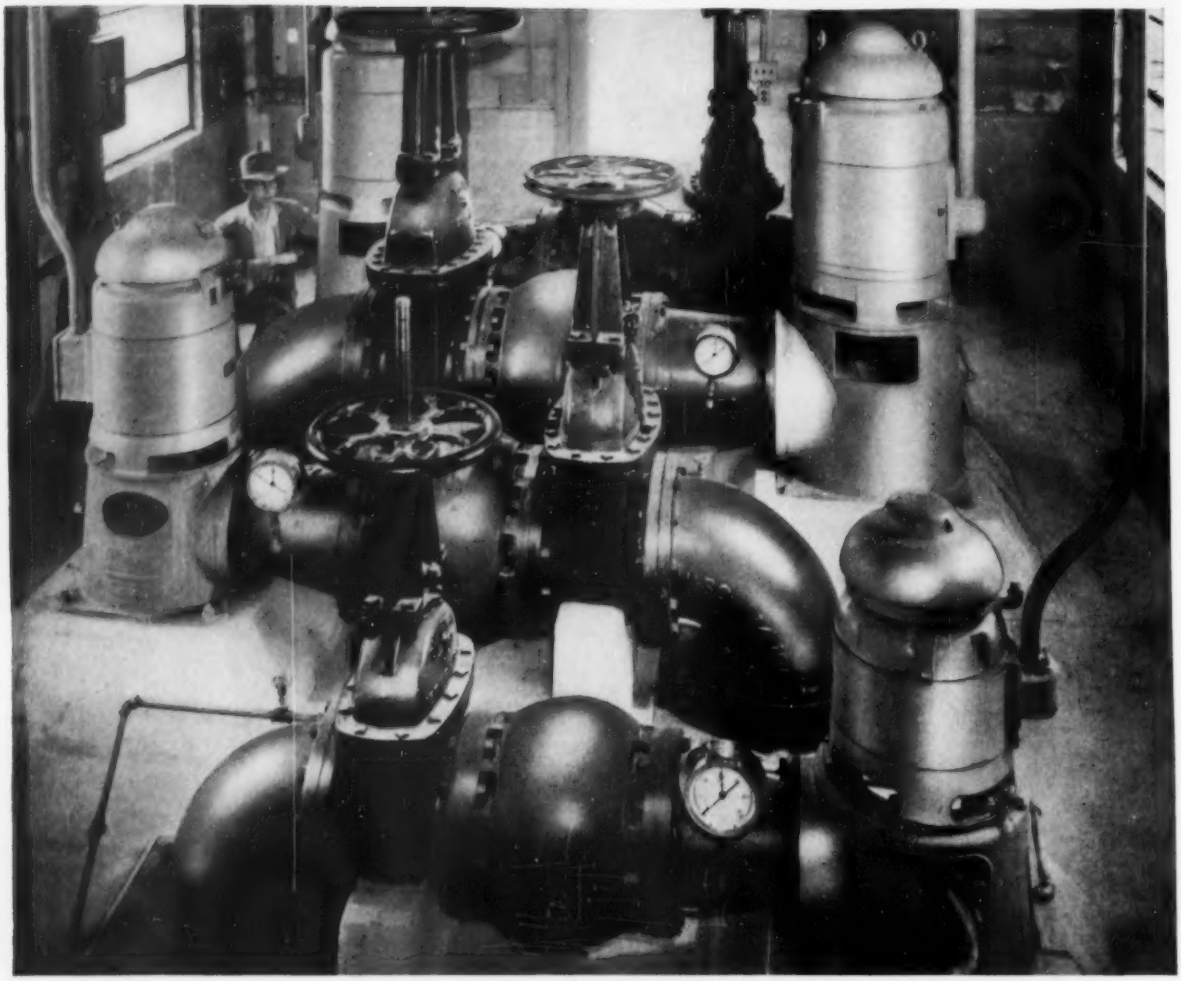

FOUR WORTHINGTON VERTICAL TURBINE PUMPS deliver 14,500 gallons of water a minute to reservoir serving Van Wert, Ohio.

Versatile is the word for these pumps

Interesting thing about this new pumping installation for the city of Van Wert, O., is that four Worthington vertical turbine pumps, usually used for deep-well service, are delivering water from a shallow creek.

This type of pump was recommended after consultation with Van Wert engineers because it needs no priming devices, suction lines, or dry-pit construction. Moreover, its vertical design takes up less space than other types. The Worthingtons have proved a wise choice — they're highly efficient, their operating cost is remarkably low, and maintenance is practically nil.

We can help with *your* pumping problem, too. Just how, is made clear in our Bulletin W-450-B40. Write for it. Worthington Corporation, Vertical Turbine Pump Division, Section D.4.30, Succasunna, New Jersey, or Denver, Colorado. D.4.30

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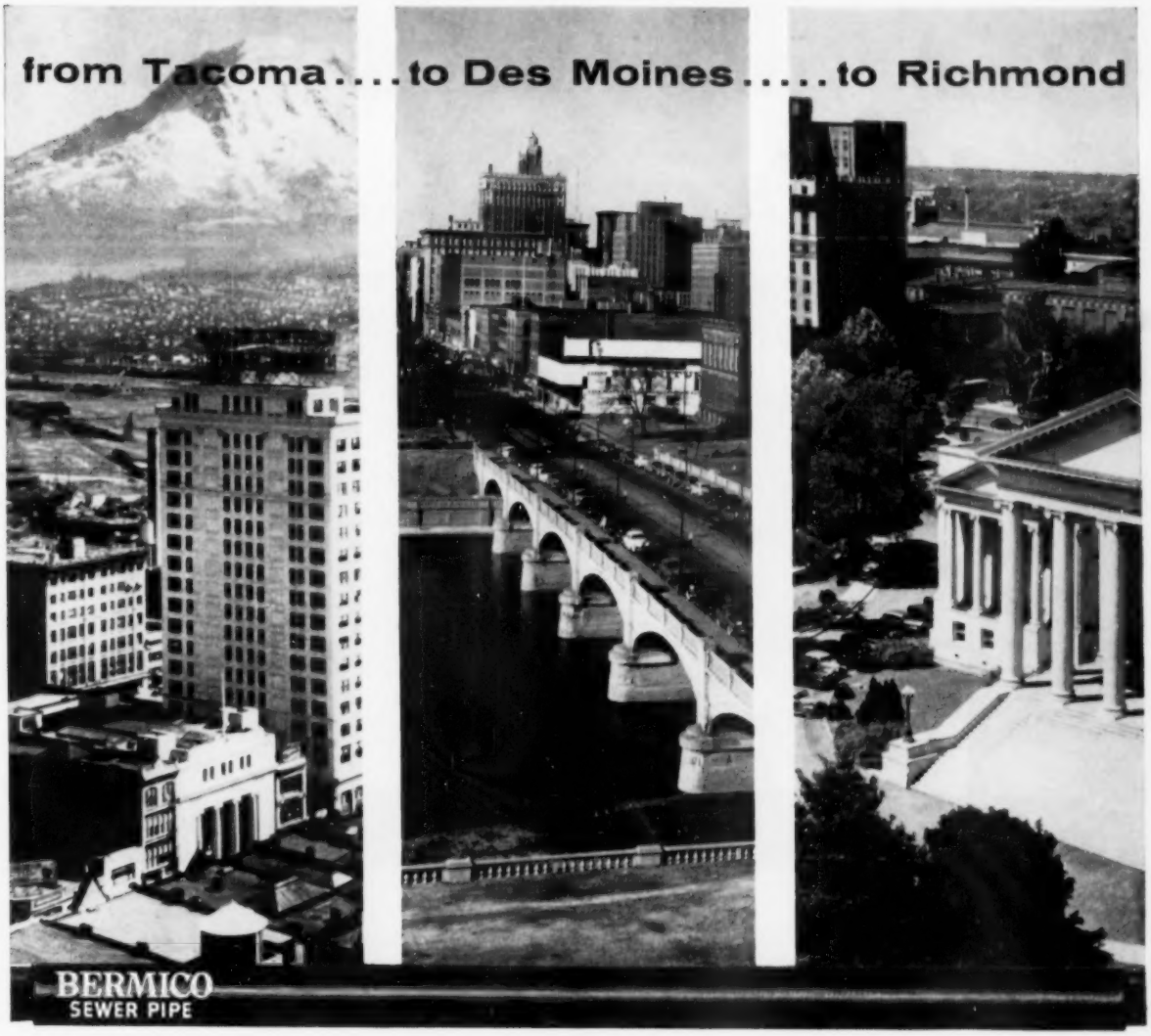

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is going into more plumbing codes than ever before

From coast-to-coast in cities and towns everywhere, more and more sanitary engineers are specifying BERMICO—for *three* main reasons:

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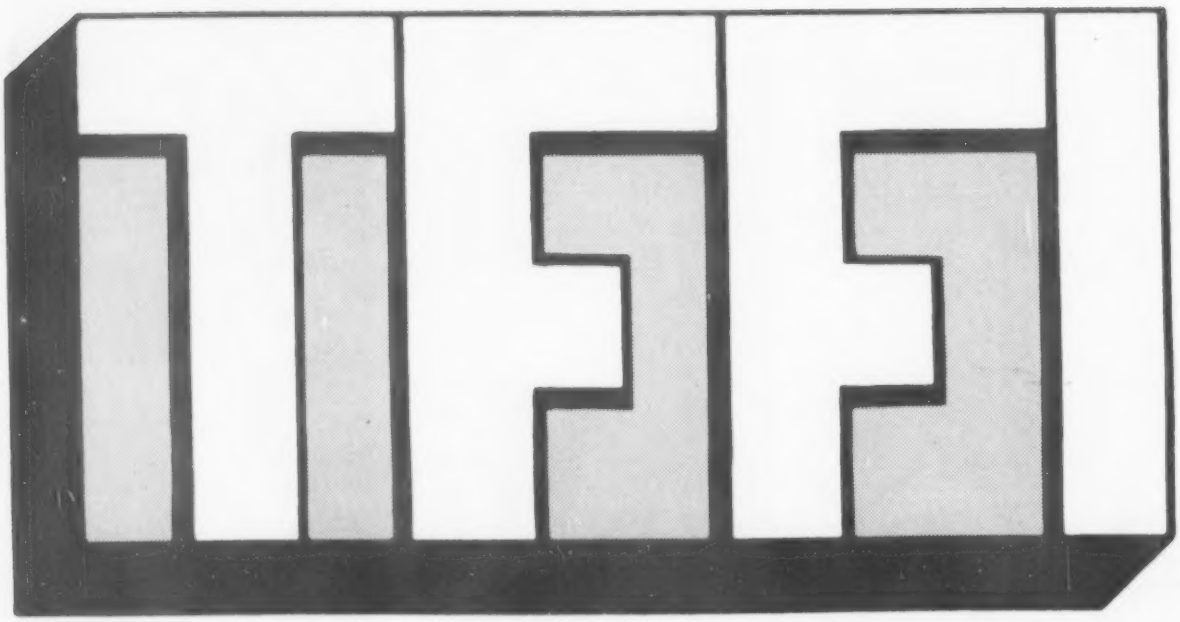

it's good!

The best trickling filters use *vitrified clay filter bottom blocks.* The reasons for this are fully described and illustrated in the new edition of the popular HANDBOOK OF TRICKLING FILTER DESIGN, revised to 1954. If you lack a copy, write any member of the Institute for one. It's free.

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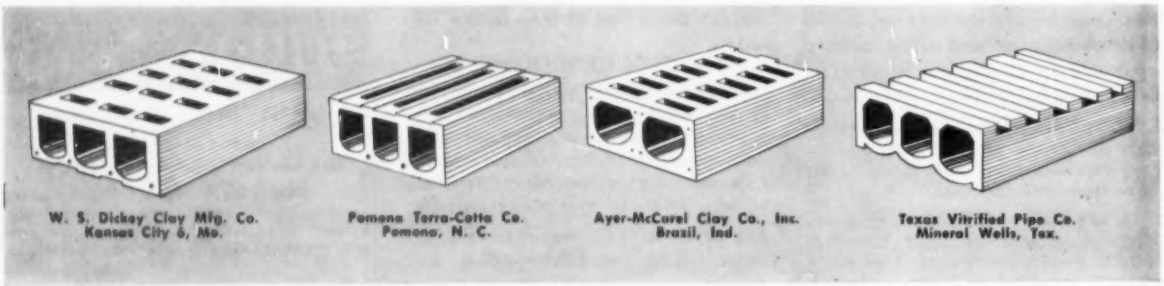

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1. *LOW COST* Overall outlays are generally lower, in the combination of initial and operating costs.

2. *EASY TO OPERATE* Any intelligent man, willing to learn how to perform a few simple tests, can run your plant.

3. *OPERATE AUTOMATICALLY* Can be equipped with automatic controls so that in all ordinary circumstances they operate efficiently.

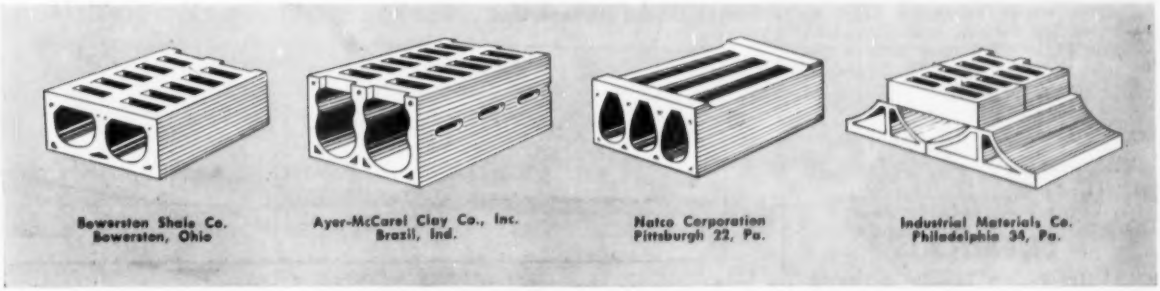
4. *LONG LIFE* Trickling filters are built for long life, to outlive the bonds you issue to pay for them.

5. *GOOD RESULTS* Top-notch efficiency—say 20 ppm BOD—day after day. Your consulting engineer can design for quality of effluent you need.

6. *OVERLOAD NO PROBLEM* Take temporary shock loads in their stride. A new industry in your community offers no new problem here.

Further trickling filter advantages will be listed in future advertisements.

FLOOR INSTITUTE



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Dodson's Digest

End the icy-road problem with $CaCl_2$

Had lunch the other day with Charlie Patton, an old school chum of mine who lives out of state and was back visiting relatives. "How's the county-road-commission business, Charlie?" I asked.

Charlie smiled and answered, "Well, Dod, I've only been a road commissioner for a little over a year. I'm convinced that it's good training for the diplomatic service."

"You mean you're becoming an expert in explaining why you're never home on time for supper?"

"No," Charlie replied, getting serious. "It's the trucking companies. Why, last winter, I was almost afraid to answer the phone. Our boys did a bang-up job of keeping the highways clear. But when the highways got slippery, the phone rang all the time —some truck held up because it couldn't make it up a grade. Yet we *did* put abrasives on the roads."

"Looks like it's time you used Calcium Chloride," I said. "A small amount added to the abrasives works wonders! Melts the ice quickly— won't refreeze, even down to 59° below zero. It anchors the sand or cinders to the road, too.

"What's more, Calcium Chloride keeps your stockpiles from freezing; saves on loading costs, because it's easier to handle . . . you use *less* abrasives! More than that . . ."

"Wait a minute," Charlie said, laughing now. "Got change for a dollar?"

"What on earth for?" I asked, surprised.

"Phone call," Charlie said, getting up from his chair. "Have to get the boys started treating the winter stockpiles with Calcium Chloride!"

—L. D. DODSON

P.S. For specific facts on how to fight ice in winter, consult our leaflet, "Melt or Skidproof Icy Surfaces with Wyandotte Calcium Chloride." A copy is yours free for the writing! *Dept. CC, Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

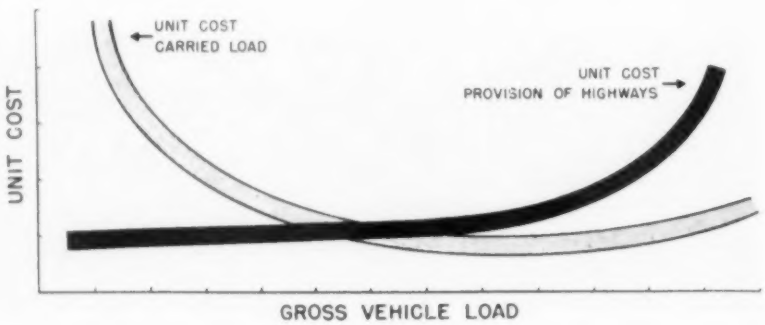
Wyandotte CHEMICALS
HEADQUARTERS FOR CALCIUM CHLORIDE

UP FRONT FOR ADEQUATE ROADS

LEO J. RITTER, JR.

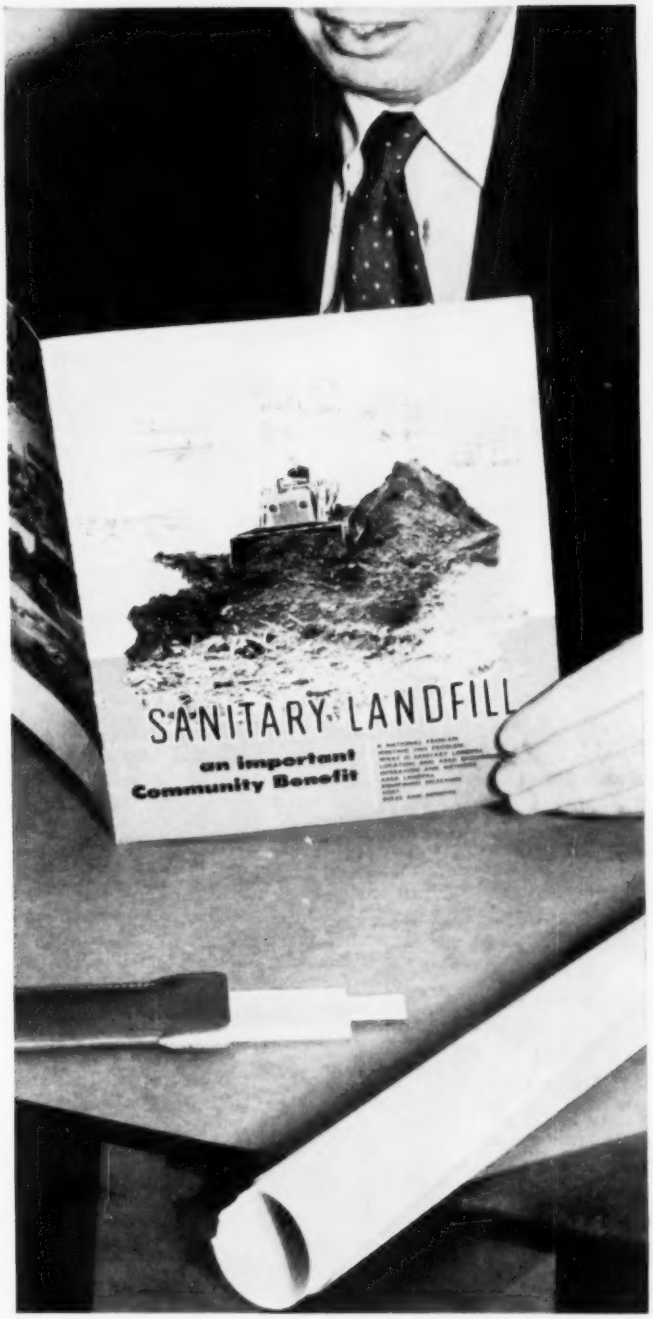
Safe-Driving Day — Wednesday, December 15, has been proclaimed as "S-D Day". It is a nationwide day to demonstrate that traffic accidents can be reduced materially when all motorists and pedestrians do their part. Every community will be asked to remain completely free of traffic accidents during the 24-hour period.

A Basic Principle — Among others, the Committee on the Economics of Motor-Vehicle Size and Weight of the Highway Research Board is conducting a study of the problem of optimum size-weight specifications for over-the-road trucking vehicles and for highway design standards. In different words, the committee is engaged in collecting and analyzing information relative to the costs of building and maintaining highways to carry different loads and the costs of transporting commodities in various types and sizes of motor vehicles. Objective is to provide a basis for agreement among all concerned relative to size and weight standards for vehicles and design standards for highways; such agreement should then result in the greatest benefit and lowest transportation cost to the general public. This relationship is expressed graphically in the drawing below, which is reproduced from a pamphlet issued by the Highway Research Board.



ASCE — Look for a rebirth of activity by the Highway Division of the American Society of Civil Engineers, reflecting the upsurge of interest in the highway program resulting from President Eisenhower's "Grand Plan". If sentiments expressed by members (and others) of the Executive Committee at a recent meeting in New York are followed by positive action, the 4000 members of the Division will have more opportunity than ever before to participate in the Division's program. Incidentally, the Highway Division is continually looking for good, thought-provoking papers for publication as Proceedings-Separates. Although we were in town, we missed Commissioner DuPont's speech at the Highway Luncheon held during ASCE's annual convention. It is reliably reported that he said, "We need more and better roads." (His speech was off the record.) The new President of ASCE is William Glidden, Assistant Chief Engineer of the Virginia Department of Highways.

On the Book Shelf — Two new excellent additions to a highway engineer's library are the long-awaited and revised "Policy on Geometric Design of Rural Roads", issued by the American Association of State Highway Officials, 917 National Press Bldg., Washington, D. C. ($3.00), and the "Bibliography of Traffic Engineering Literature" compiled by the Bureau of Highway Traffic,



Here's real help for

Selling Community Health

New Allis-Chalmers booklet tells — illustrates how landfill method can meet problem of sanitary refuse disposal efficiently and economically.

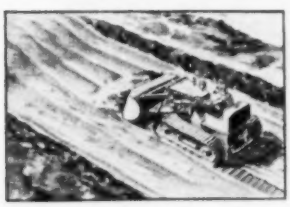
Disposing of garbage is a recognized headache for any community too small to make incineration feasible. Explaining how the sanitary landfill method can do the job is a difficult challenge. That's why sanitation officials will find this new Allis-Chalmers booklet especially helpful.

Titled "Sanitary Landfill — An Important Community Benefit," it covers the subject step by step: (1) analyzing the problem, (2) how sanitary landfill meets it, (3) what the basic requirements for landfill are, (4) method of operation, and (5) selection of equipment. Photographs and drawings are used throughout the booklet to make the descriptions as clear as possible.

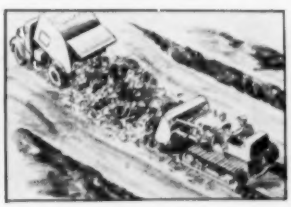
If your community faces the problem of sanitary, yet economical disposal of refuse, it will pay you to get a copy of this helpful booklet now. Just call your nearby Allis-Chalmers dealer (or write direct). He'll be glad to send you one and to give you any additional information you may want. Booklet No. MS-895-5210.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

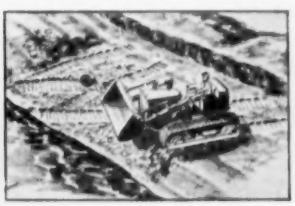
Illustrations from section on trench method of landfill.



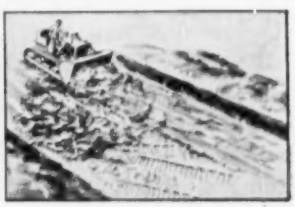
Trench 75-400 ft. long, 3 ft. deep, 15-25 ft. wide may be excavated, using dirt to build ramp along one side.



Incoming trucks dump from ramp into trench. Dumped refuse is then spread and compacted by crawler tractor.

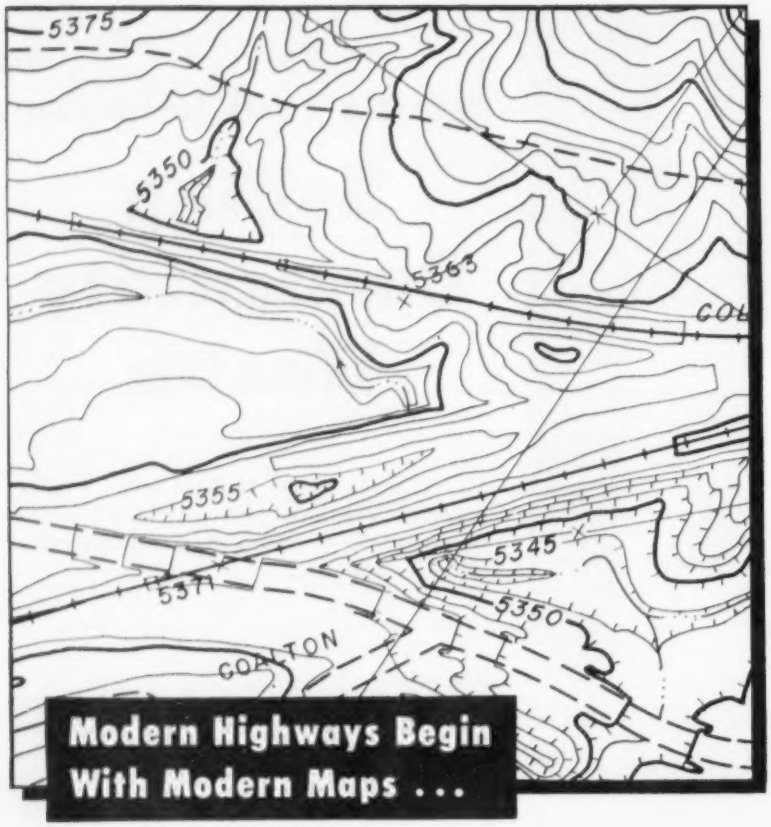


Successive layers are compacted until a cell is formed in trench, consisting of refuse dumped in one day's operation.



Top and open end of cell are covered by earth seal taken from second trench adjacent and parallel to first.

Need more facts about advertised products? Mail your Readers' Service card now.



Modern Highways Begin With Modern Maps . . .

Post-war automobile production has put more vehicles on our highways than they were ever designed to handle. More and new types of highways are vitally needed now. Freeways, turnpikes and toll roads are being planned to shorten the distances, reduce grades and reduce travel time.

To meet this immediate need, highway officials and consulting engineers have turned to the services of Jack Ammann Photogrammetric Engineers. With Jack Ammann photogrammetry work can be speeded — costs can be cut—just as the highway projects listed have found.

Consult us on your mapping needs. Put our nearly a quarter-of-a-century of mapping experience to work.

Topographic maps produced by Jack Ammann photogrammetric methods— have been produced— or are now being produced for the following:

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- West Virginia Turnpike
- Kansas Turnpike
- Dallas-San Antonio Turnpike
- Dallas-Ft. Worth Turnpike
- Highway Departments of Vermont, Massachusetts, New York, Connecticut, Rhode Island, New Jersey, Kansas, Texas, California, Washington and Oregon.

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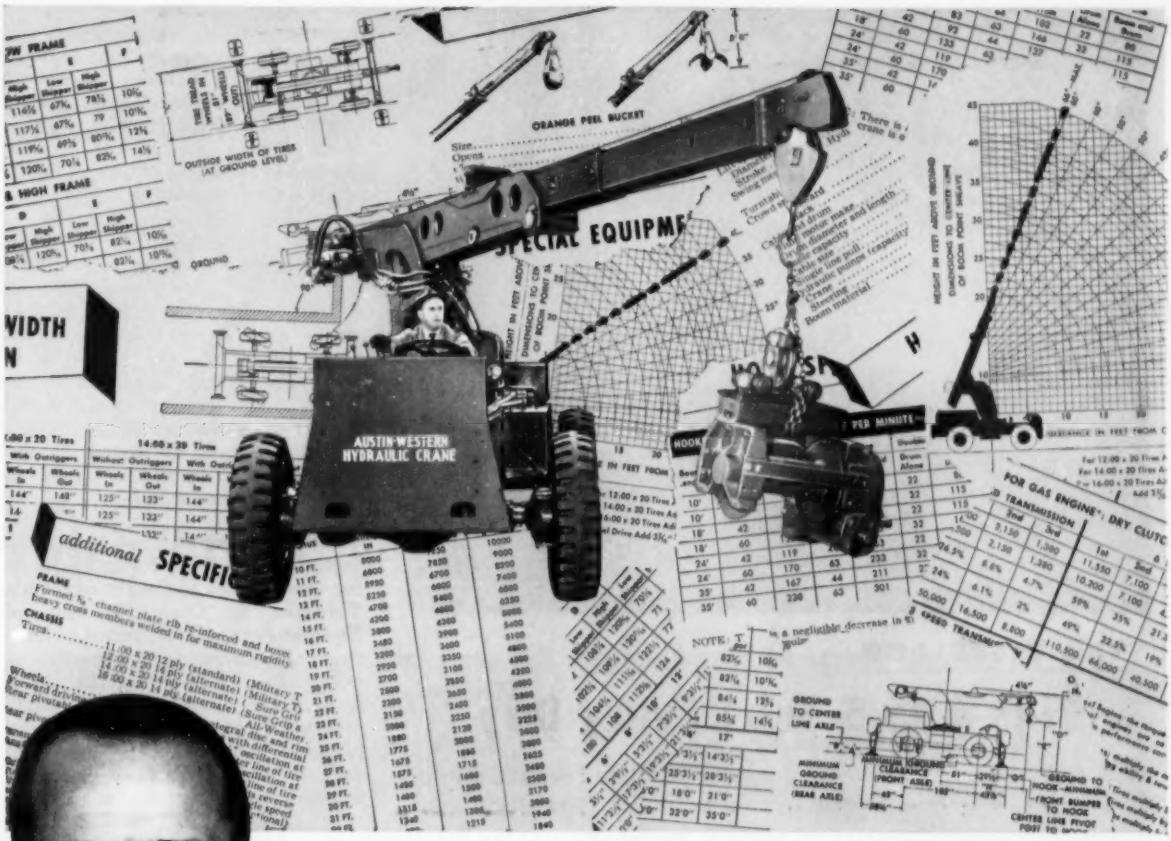
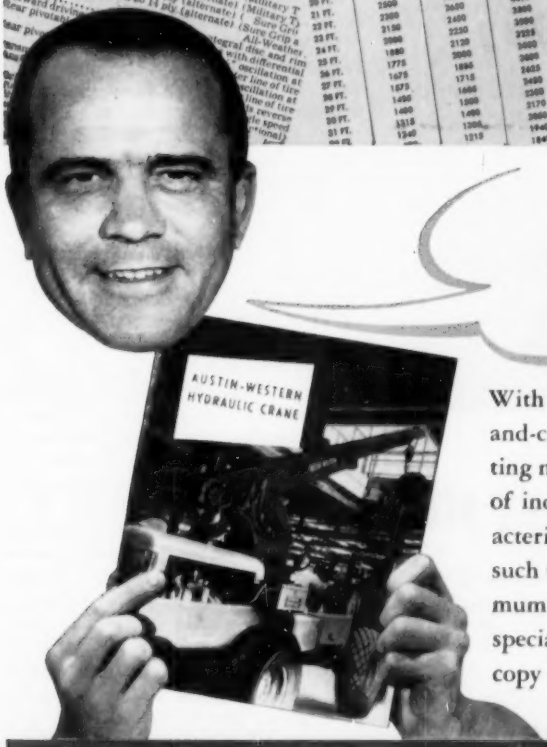
Yale University, New Haven, Conn. A magazine of considerable interest to municipal engineers and officials is the "Street Lighting Magazine", issued quarterly by the National Street and Traffic Safety Lighting Bureau, 140 Terminal Tower, Cleveland 13, Ohio; indications are that it is free for the asking.

Rubber-Asphalt — The October issue of *Public Roads*, official research organ of the Bureau of Public Roads, is devoted to two articles on rubber-asphalt. They report the results of laboratory research studies on (1) rubber-asphalt blends and (2) rubber-asphalt paving mixtures. Details of the studies are too long to be presented here. General conclusions, however, are "The effects of the addition of different rubbers to different asphalts may vary widely; the use of rubber shows promise of benefits in some respects; in others it does not. Conclusions as to benefits of real economic value in the addition of rubber to asphalt must wait on further observation of the behavior of experimental pavements under the influence of age, weather, and traffic. None of these experimental pavements has as yet shown significant behavior differences between comparable rubber-asphalt and plain asphalt sections."

Conversation — Enjoyed a recent visit in Washington with Jerry Buckley and Carl Fritts of the Automotive Safety Foundation; the Foundation is as busy as ever, with major studies underway in Kentucky, Tennessee, Rhode Island, and Michigan, plus various other projects. Also dropped in on Bill Dickinson and George Kimber of the Calcium Chloride Institute; these lads are keen operators. Incidentally, the Institute has some new, real interesting dope on tire weighting on construction equipment (filling tires with $CaCl_2$ and water). Frank Brown and Don Gehring of the Wire Reinforcement Institute are nice people; found them discussing the latest experience with the use of welded wire fabric for reinforcing asphaltic concrete mixtures in resurfacing of concrete pavements.

Personal Observations — We got caught right in the middle of Chicago's record-breaking rainfall and flood in October, trying to go by car from Naperville to Evanston at the height of the storm. We made it o.k., but more than once we wished we had an amphib instead of a conventional car. Traffic was really





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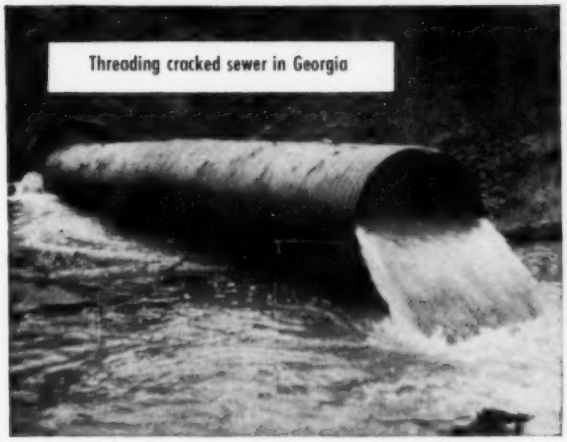
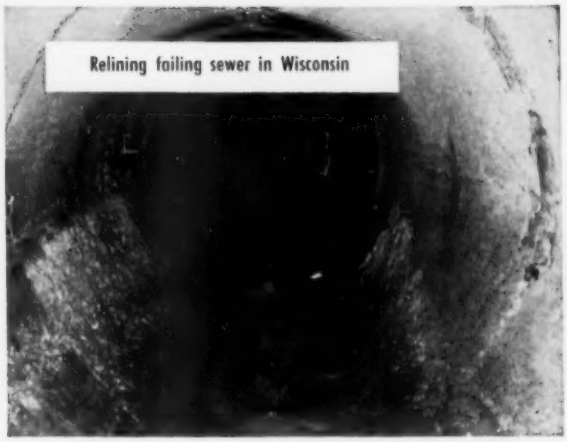
snarled up, with more than 30 major highways in and around the city blocked in various sections because of high water. In many places, the highway actually was serving as a channel for flood flows. What a mess! A man can really believe in the importance of highway drainage in that sort of situation. On our return trip, we were tempted to abandon the car and ride the train; only trouble was, Union Station was full of water and the trains weren't running either. The rainfall in that storm was about 8 inches in 36 hours or so. We got to wondering what would have happened if the rainfall had come up to the world record of 46 inches in a 24-hour period, observed at Baguio in the mountains of northern Luzon in the Philippines. Wow—.

Toll Road Progress — A 21-mile section of the Ohio Turnpike (from the western end of the Pennsylvania Turnpike to Ohio 18 west of Youngstown) will be opened to traffic on December 1. Construction is practically complete on the Delaware River extension of the Pennsylvania Turnpike; by mid-1956 the Delaware River bridge and road connection with the N. J. Turnpike are expected to be open. By the time this is printed, all 88 miles of the West Virginia Turnpike should be in service. Meanwhile, in a recent speech in Chicago, R. B. Murray, Jr., Under Secretary of Commerce for Transportation, reaffirmed the about-face of the federal government in its attitude toward toll roads.

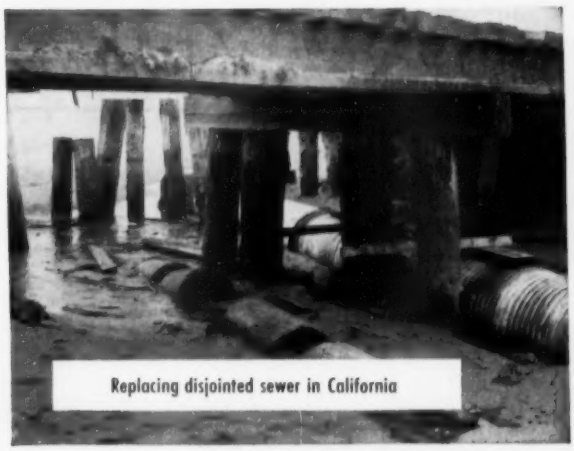
From Here and There —Our Washington sources seem confident that the basic $5 billion-a-year program which has set the highway industry agog *will* go through, regardless of the party balance in Congress. The amount may be less, but the program has gained too much impetus to be stopped now. Incidentally, the results of the study made by the Bureau of Public Roads of highway construction needs in this country in the next ten years place the total at $54.5 billion more than is available from normal sources. Simple ceremonies late in October marked the opening of the full length of the Washington-Baltimore Parkway.

We Stand Corrected — A note from J. A. Leadabrand of the PCA informs us that 15 million square yards (instead of half a million, as reported in the November issue) of soil cement will be built in 1954. Thanks, Joe.





Which Armco sewer saved the most money?



Was it relining the failing sewer; threading the cracked pipe; replacing the disjointed structure; or installing an Armco Sewer in a brand-new installation? Fact is, they *all* saved plenty of money. But considering original costs, the *new* Armco Sewer will save much more through the years.

The new Armco Pipe will be faced with the same hazards that were disastrous to the other structures. But because of the flexible strength of corrugated metal, there is no danger of cracking. Positive bolted connections eliminate disjointing. And with Armco ASBESTOS-BONDED Pipe, the corrosive sewage will not cause damage. A long life for the new Armco Sewer is assured.

No two sewer problems are alike. But Armco can supply a structure to solve practically all of them. Armco Corrugated Metal Pipe and Pipe-Arch are recommended for normal sewer use; ASBESTOS-BONDED Pipe and Pipe-Arch for severe corrosion problems; MULTI-PLATE Pipe, Arch and Pipe-Arch for large area requirements. For sizes and other factual details, write us. Armco Drainage & Metal Products, Inc., 1394 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: Write Guelph, Ontario. Export: The Armco International Corporation.

Armco Sewer Structures

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Extremely simple design with outstanding performance. This heavy duty industrial type loader has double acting, oversize hydraulic system. Raising height sufficient to clear average size trucks equipped with sideboards. Bucket capacity is 12 cu. ft. High down pressure enables digging and handling of tough, hard-packed material. Bucket roll-back is provided for handling loose material.

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Ideal for projects where Fast Digging is required, the SCOUT 70 has extra speed, extra power, plus extra digging depth. Can be installed or removed from almost any tractor in approximately 20 minutes. Buckets for both rock and earth digging available in a variety of sizes.

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Whether it's a large culvert, a chain link fence, or a fence post, remember, if it's iron or steel, have it Hot-Dip Galvanized. For the best in galvanizing, send your products to a member of the American Hot Dip Galvanizers Association . . . he has the know-how to give you a top quality job.

Send today for our new booklet "Stop Rust." It gives you the full story on the process, plus a comprehensive coating comparison chart. "Must It Rust" 16 mm film available for showing.

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The modern Nichols Herreshoff sewage sludge dryer-incinerator, providing dependable, economical, dual-purpose sludge disposal with a performance record unmatched by any other sludge incinerator, is made possible by the knowledge gained in supplying these furnaces to users all over the world.

Circular multiple hearth furnace development has been a Nichols preoccupation since its conception and has continued to be so with each successive improvement in design and scope of application. Some of the milestones in this history are:

1889-First circular multiple hearth furnace, the Nichols Herreshoff.

1909-First low-pressure, air-cooled furnace shaft and rabble arms.

1931-First multiple hearth furnace for the incineration of sewage sludge.

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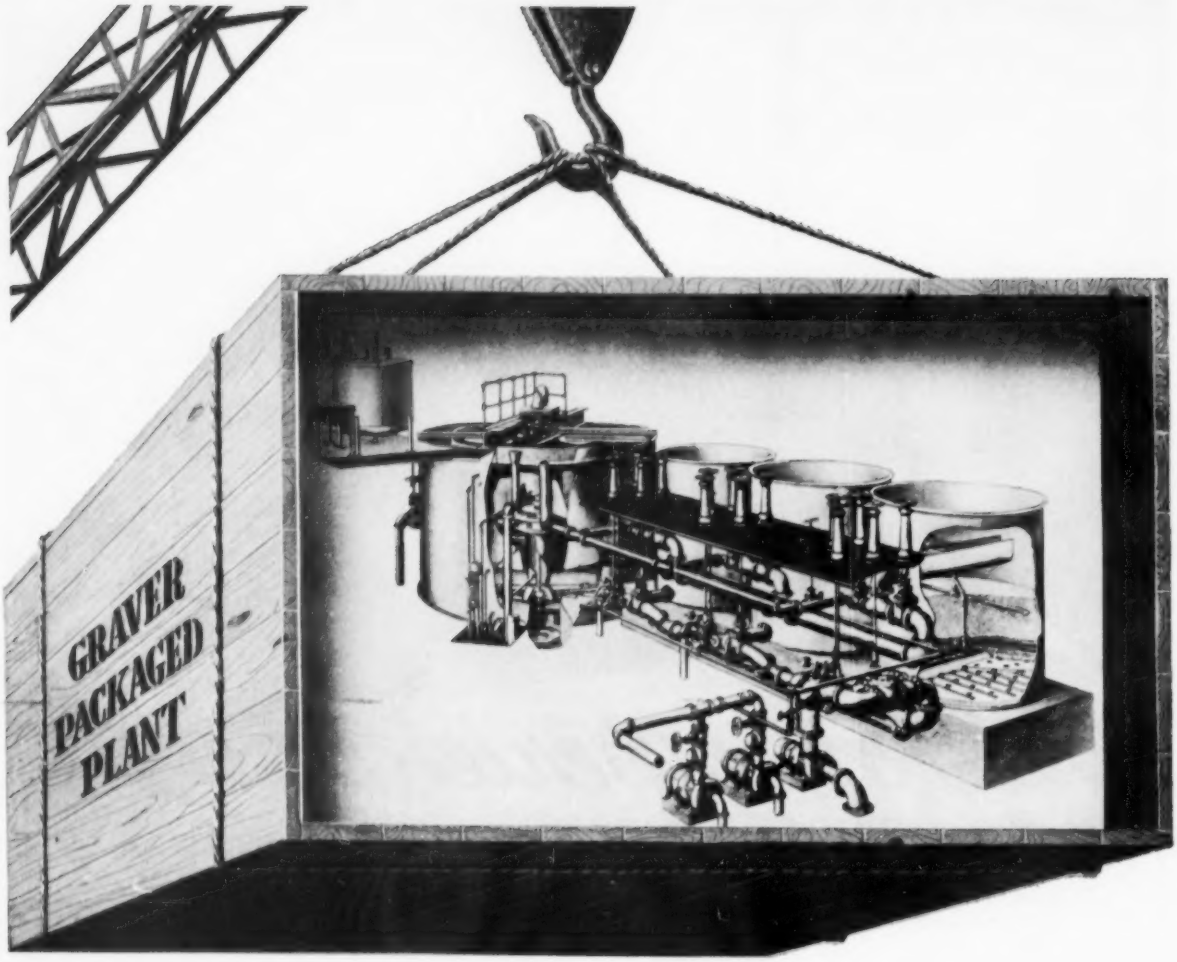

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1 Vertical installation of 20" x 10" Builders Venturi Tube on discharge side of raw sewage pump . . . Chronoflo Transmitter at lower left. Plant also uses a Builders Flo-Watch Venturi Meter for Sludge Measurement . . . and Omega Universal Feeders for alum, Ferri-floc, and hydrated lime.

2 Builders Chronoflo Electric Receiver for totalizing, indicating, and recording raw sewage flow. Instrument is conveniently located in control building lobby.

With the completion of this 3.3 MGD Sewage Plant by Mosser Construction, Inc. of Fremont, Ohio, Mt. Vernon has been able to abandon its obsolete and inadequate Imhoff-type plant. The treatment process includes primary treatment and pre-aeration, supplemented by chemical precipitation during Summer months. Sludge is disposed by separate digestion and by sludge drying beds.

The plant employs the latest in Builders Metering Equipment to promote uninterrupted and efficient plant operation. For details on Builders Equipment engineered specifically for sewage plant service, address Builders-Providence, Inc., Providence, Rhode Island.

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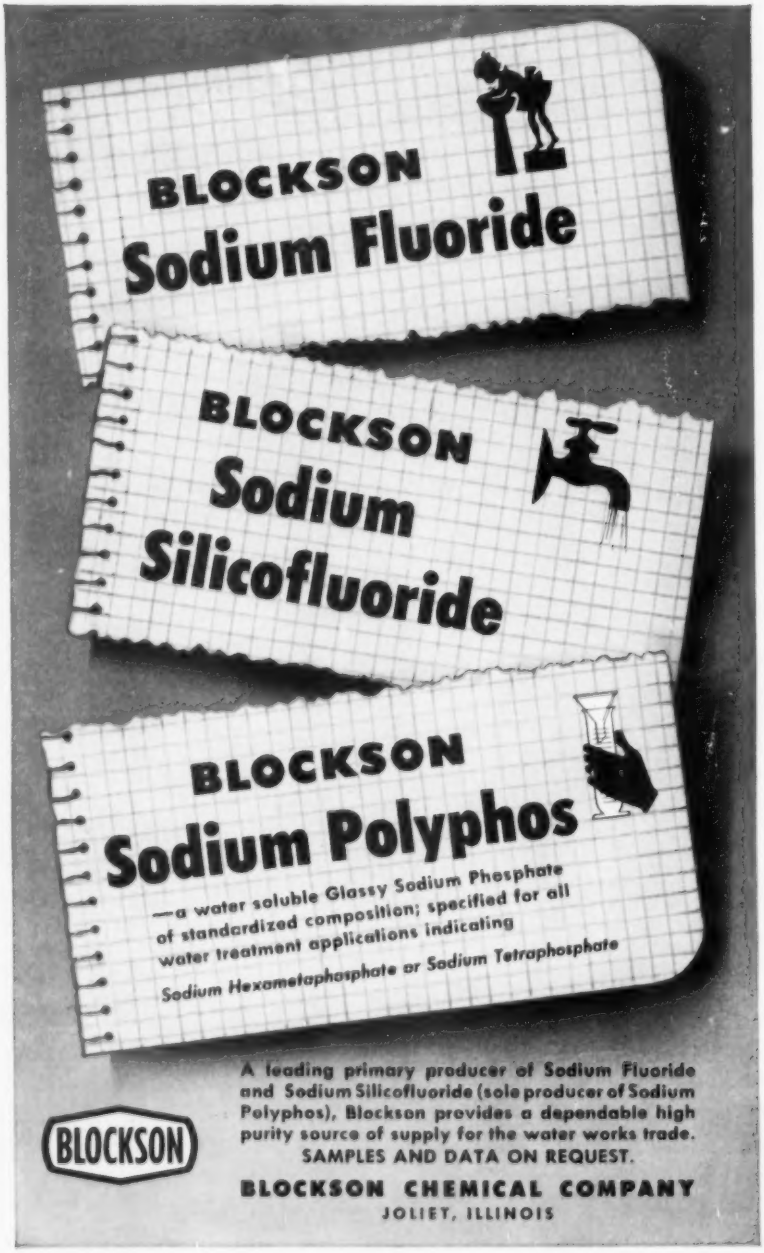
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Ode to A Racket

'Twas the night's waning hour
And all through the home,
A snoring home owner
Slept fast as a gnome.

When out in his alley
There arose such a clatter
He sprang from his bed
To see what was the matter.

He flew to the window,
Threw open the sash,
Saw a crew of collectors
Putting refuse and ash

In a high-sided dump truck
That echoed and rang
Every time a steel bucket
Hit its sides with a bang.

The irate tax payer
Took his phone in a huff,
Berated the city
For pulling such stuff.

"Collectors," he said
"Shouldn't work at such hours,
For six in the morning
Is strictly for flowers.

"From ten until two
Is the time to dispel
The duties that make
Such a racket and smell.

"Better yet," he continued,
With words most emphatic,
"Get rid of that noise—
GET A HEIL COLECTOMATIC!"

QUIET PACKING OPERATIONS UNDER ALL CONDITIONS because with the Heil COLECTOMATIC, there are no continuously moving, clanking chains! Just a slight engine acceleration for the packing operation is all that's heard, and often several stops may be made before packing is necessary.

CLEAN, ODOR-FREE COLLECTION because a steel plate—an integral part of the tailgate—seals off the body proper to a height of 4 inches above the body floor. This prevents liquids from draining out of the body to the street or back into the loading hopper.

DOZENS OF ALL-NEW COLECTOMATIC FEATURES will slash your refuse collection costs. Ask about the "bulldozer" packing action, easy service accessibility, low maintenance features.

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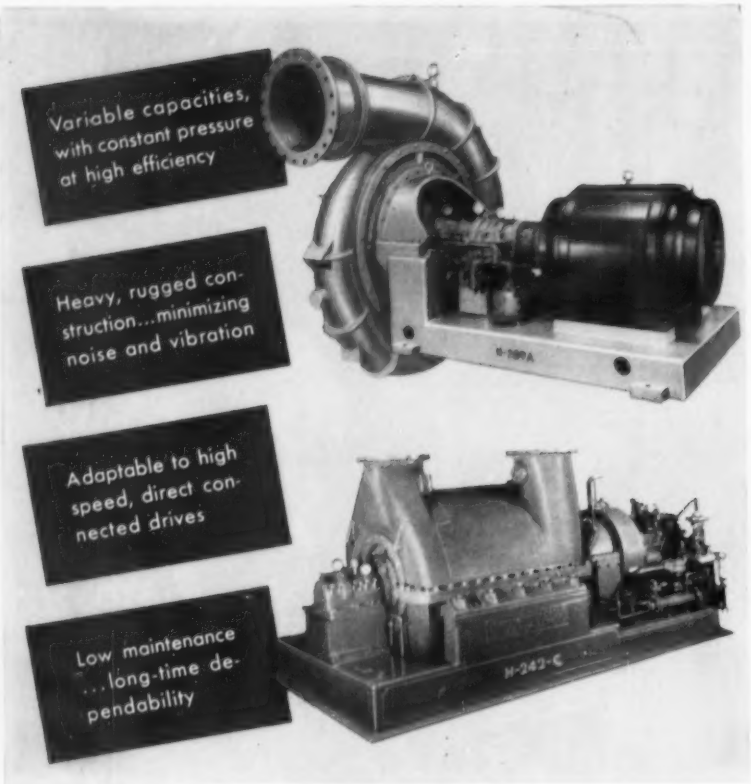
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Your specific needs may dictate other important characteristics in centrifugal blowers or exhausters. But even so, these four values are essential to over-all successful performance. You'll find them in every Roots-Connersville Centrifugal Unit, regardless of size. And if you desire variations to suit your application, the ability to meet these needs is a heritage of our 100 years' specializing in equipment to handle gas and air.

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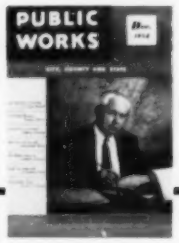

Edward J. Clark is Chief Engineer of the Bureau of Water Supply, Department of Water Supply, Gas and Electricity, of the City of New York. It is his responsibility to see that a billion gallons a day or more of water are delivered in good condition to city homes and industries. When rains fail, it has been sometimes a tight squeeze, but the newly completed Catskill additions should ease this situation from now on. Eddie Clark attended St. John's College in Brooklyn and started his engineering career in 1917 with the ICC; this was interrupted when he served with the Navy in World War I. He entered New York City service in 1920, coming to the Department of Water Supply, Gas and Electricity in 1921.

During his more than thirty-three years in the Water Department he has worked in the Design, Construction, and Water Waste Divisions. In 1946, after having served as Borough Engineer in charge of the Bronx for twelve years, he was assigned as Deputy Chief Engineer of the Bureau of Water Supply, and was promoted to his present position of Chief Engineer in 1947.

He is a member of the American Water Works Association, the Municipal Engineers of the City of New York, and the New York Athletic Club. He is active in American Legion affairs, was Commander of New York County in 1947, and is currently President of the New York State and New York County Mountaineers, Inc., an affiliated branch of the American Legion, which operates a large camp at Tupper Lake, New York, for convalescent veterans.

Mr. Clark is married and has one daughter. His home is in New York City's Bronx.

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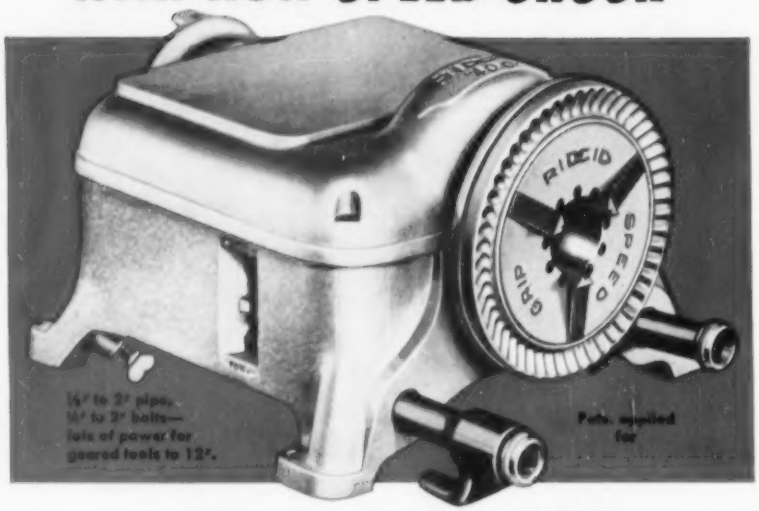

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The amazing new chuck on this 400A is not just another hammer chuck. It operates on a new principle of gripping pipe and rod. Guaranteed to hold any kind of pipe securely both ways, forward or reverse. No slipping, even in driving geared tools. Extra easy to operate: close jaws on work with hand wheel, sock lightly—motor action makes it grip tighter; releases easily by turn of hand wheel. Thousands of these efficient, powerful, durable units in use everywhere. For most service for your money, ask your Supply House for the new 400A. (No. 400 with lathe-type chuck also available.)

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TRENCH BOXES FOR SEWER WORK

Your July issue carried an article written by the undersigned describing the construction and use of a trench box in sewer excavation. Shortly after this article was published, we received a notice from the Treaty Excavating Co. of Greenville, Ohio, claiming an infringement on a patent held by them on a similar device. In your October issue I notice a letter with the same claim in your "Letters to the Editor" column.

For your information, and that of your readers who may be interested, this matter was referred to our patent attorneys. It is their opinion that there is no infringement for the following two reasons:

1. Some of the claims contained in the Treaty Excavating Co. patent are not present in our trench box.
2. There was prior public use of our trench box approximately two and one-half years before the recorded date of the patent in question.

R. H. Schneider
City Engineer
Marshfield, Wis.

BOOKS IN BRIEF

LIFE IN STREAMS & LAKES

A new book by Prof. Robert E. Coker, University of North Carolina, covers this important related field of water supply. There are three parts—I, light, heat, flow, stratification, basic nutrients and characteristics; II, running water; and III, still water. 345 pages, many illustrations, $6. University of North Carolina Press, Chapel Hill, N. C.

WATER CONDITIONING

This is a new edition of the well-known and highly useful Permutit Data Book. There are 108 pages, pocket size. Includes hydraulics

INFILCO

use this

library of water treatment plant design information

No matter whether your water problems are SIMPLE or COMPLEX – INFILCO has the answers. If softening or clarification, removal of color or iron, or tastes and odors are involved – INFILCO has the experience and equipment to do the job. Listed below are a few of the bulletins containing useful information for you. DON'T DELAY – WRITE TODAY. For more information on a specific problem contact our Tucson office or any of our 33 field offices.

ARE YOU LOOKING FOR GENERAL INFORMATION ON MUNICIPAL PLANT EQUIPMENT?

Write for our condensed catalog containing information to help you in selecting the more detailed bulletins which are available covering all the types of water and sewage treatment.

Bulletin 60-P

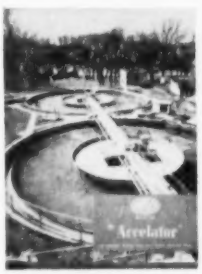
DO YOU WANT INFORMATION ABOUT THE MOST MODERN FILTER CONTROLLERS & GAUGES?

C.-A.-P. SYSTEM® instruments provide flow control as well as accurate measurement of loss of head and rates of flow.

Bulletin 1100-P

ARE YOU CONSIDERING A CLARIFICATION OR SOFTENING PLANT?

Whether a new plant or enlargement of an old is needed, the ACCELATOR® clarifier or softener will provide the best results at the lowest installed cost. In many cases an "ACCELATOR" mechanism can be installed in an existing basin to increase capacity as much as 400%.



Bulletin 1825-P

DO YOU NEED WATER TREATMENT FOR SMALL COMMUNITIES?

The "ACCELAPAK" treating plant employs the most modern methods of treatment – developed specifically for small municipalities where technically trained operators are not available.

Bulletin 1870-P

It's the results that count!

INFILCO equipment and treatment methods have long been recognized leaders in the field because emphasis is on performance with the best combination of equipment for effective, economical operation.

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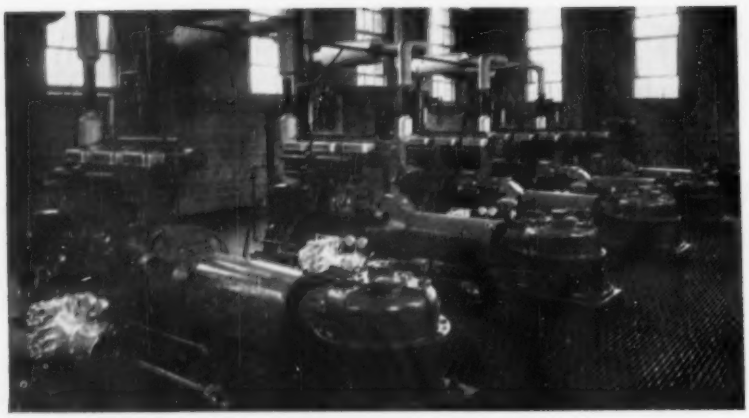

14 YEARS LATER

8 Climax Engines installed in 1940 in the Rock Island, Illinois, Sewage Treatment Plant are "all in excellent shape today," reports Mr. Armin J. Grossell, Supt. of Public Service.

2 Engines, rated 75 HP at 720 RPM respectively driving sewage pumps have a total of 12½ years operation between them.

1 Engine, direct connected to a 720 RPM generator has run over 75,000 hours.

5 Engines, rated 125 HP at 1200, connected to storm sewer pumps, operate only during emergencies. One of the 5 has logged 24,000 hours.

A careful maintenance program has contributed to the fine engine performance. Such performance is to be expected when you specify Climax.

Plant designed by and built under supervision of Consoer, Townsend and Associates.

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- We will supply enough equipment to clean your sewers, and a man to supervise the operation, on a rental basis.
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- Safe domestic defense requires clean, well operating sewers.

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chemical conversions, chemicals used, acid and alkali dosages, chemical reactions and conversion factors. Available to practicing engineers and others who work with water conditioning problems. Permutit Co., 330 West 42nd St., New York 36, N. Y.

BACK SIPHONAGE

Reprint of a paper, copyrighted, by W. M. Dillon, Watts Regulator Co., Lawrence, Mass. This is an excellent exposition of what may happen to cause back siphonage; and it also covers prevention, including air gaps, check valves, etc. 16 pages; no price given.

DYNAMIC TESTING OF SOILS

A symposium of papers on dynamic testing of soils. These were presented at the 1953 meeting of the ASTM and they have been assembled into ASTM Special Publication 156. In the 261 pages, there are 13 papers. Price is $3.50 from ASTM, 1916 Race St., Philadelphia 3, Pa.

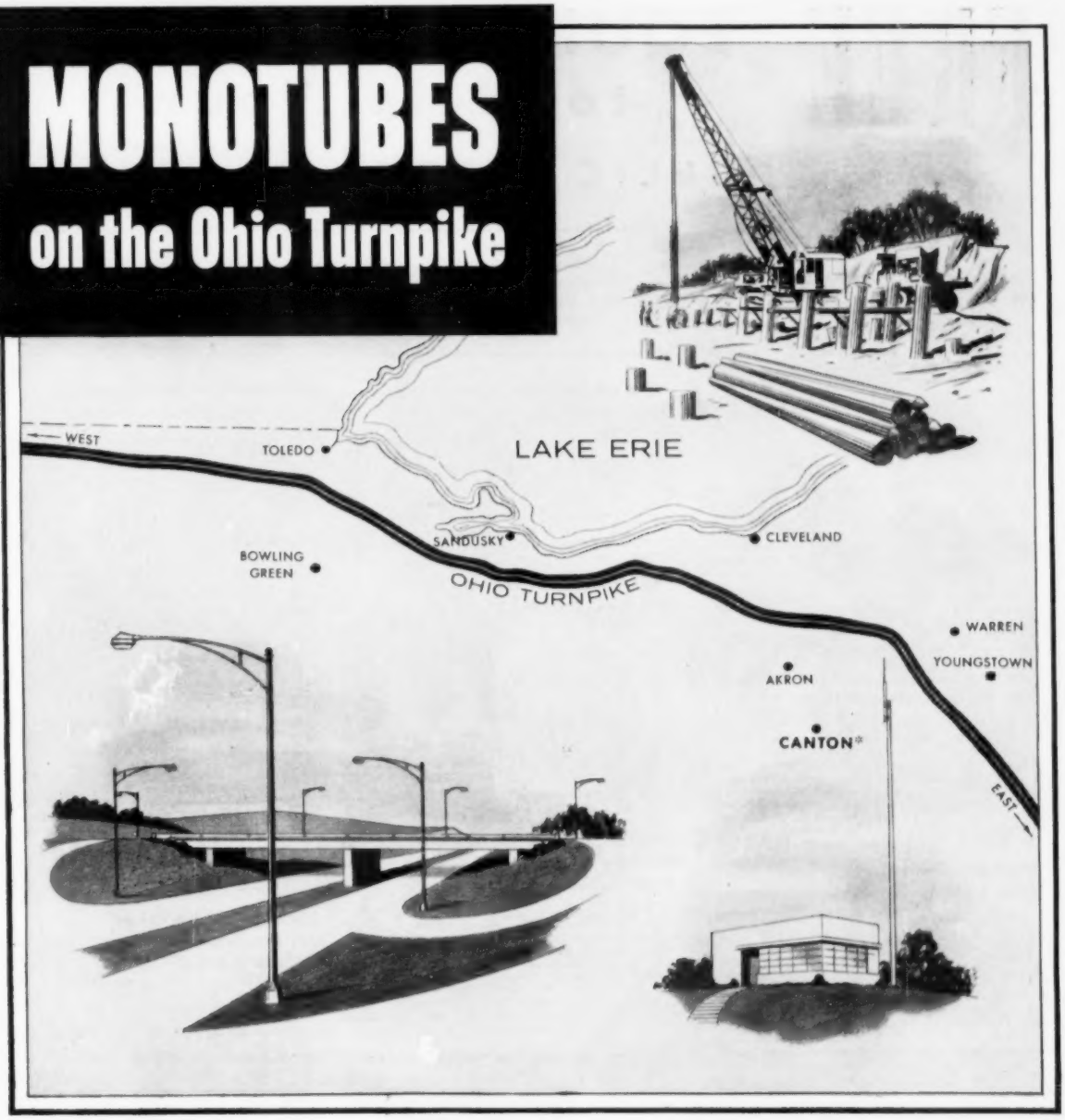
PRACTICE OF SANITATION

Eddie Hopkins and Wilmer Schulze have done a nice job on this second edition, which is a fine textbook for the sanitarian and young sanitary engineer engaged in health work. It covers sanitation in food, water supply, milk, refuse collection and disposal, sewage and industrial wastes, air, housing, transportation, motor courts, camps, swimming pools, etc., as well as the principles of insect and rodent control. 454 pages, 129 illustrations. We do not have a price on this book yet, but you can get it from The Williams & Wilkins Co., Baltimore, Md.

WATER AND SEWERAGE SHORT COURSE

Papers presented at the Louisiana State Short Course for water and sewerage plant superintendents and operators are available in Bulletin No. 44 from Louisiana State University. Included in the contents are: Safety; Plant Arithmetic; Disinfection; Bacteriological Examination; Operation of Water Filters; Taste and Odor; Filters for Sewage Treatment; Control Tests; Distribution and Plant Equipment Maintenance. Attendance List and Minutes of the Meeting are also included. This bulletin contains 160 pages and the cost is $1.00. Engineering Experiment Station, Louisiana State University, Baton Rouge 3, La.

MONOTUBES
on the Ohio Turnpike



ALL along the 241-mile Ohio Turnpike you'll find steel Monotubes—1,322 Monotube lighting poles for entrance plazas and interchanges, 44½ miles of Monotube foundation piles for structures, and self-supporting Monotube antenna masts at each of the 15 interchanges and the two terminal gateways for radio communication.

Take the tip from leading contractors and engineers . . . specify Union Metal Monotubes. For further information, write today to The Union Metal Manufacturing Company, Canton 5, Ohio.*

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FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Tractor-Backhoe Combination Offers Big Returns

30. Features of the Allis-Chalmers Model WD-45 wheel tractor equipped with Henry backhoe and other Henry hydraulically operated attachments are outlined in an attractive 8-page catalog now available from the Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis. In addition to specifications, the catalog includes illustrations of the basic unit and of various Henry front and rear mounted attachments plus details of the tractor itself. Get Catalog MS-982 by checking the coupon.

Solids Pump Uses Recessed Impeller

34. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details, get Bulletin SP-10 by writing to Western Machinery Co., 76 Folsom St., San Francisco, Calif., or check the coupon.

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check coupon or write Gar Wood Industries, Inc., Wayne, Mich.

Investigate These Street Lighting Standards

84. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy coupon. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Chemical Resistant Coating For Concrete Pipe

55. Rexon Coating No. 2, developed specifically to protect concrete pipe against the chemical attack of sewage and industrial wastes, is described in Bulletin R-2 of Hamilton Kent Mfg. Co., 427 West Grant St., Kent, Ohio. Properties of this coating make it virtually inert to all acids, alkalies, oils and solvents. For full details on characteristics, working properties and methods of application check the handy coupon.

Engineering Data on Screening Equipment

77. Water, Sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Dept. 137, 307 No. Michigan Ave., Chicago 1, Ill. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable, comprehensive booklet may be obtained by checking the coupon.

Cleaning Service Revives Clogged Trickling Filters

104. Some older trickling filters which have small stone, improperly placed media or other defects have experienced troublesome clogging which reduces their effectiveness. Now successful in-place cleaning of these filter beds is offered by Solvent Service, Inc., 242 Latimore St., Painesville, Ohio. Details of this operation, and results of cleaning performances are provided in an interesting booklet. Get your copy by checking the coupon.

Maintenance Painting Systems for Sewage Treatment Plants

56. Recommended maintenance painting systems for sewage treatment plants, based on a detailed study of sewage plant painting problems, practices and experience, have been compiled by The Tropical Paint Co., Cleveland, 2, Ohio. Virtually all types of plant equipment are considered in some detail, and information is provided on both new work and repainting. Get this helpful report by checking the coupon.

Small Tractor Has Countless Uses

63. The "Agricat" tractor provides a small, powerful unit that can be used on lots of jobs. Tight spots are no obstacle. Attachments for dozing, snow plowing, loading. Full data available from Earl H. Pence & Co., Inc., 2150 Washington Ave., San Leandro, Calif. Check the coupon today.

Poz-O-Pac for High-Strength Base and Subbase Construction

117. Poz-O-Pac, said to be a new concept in paving construction which uses a lime-fly ash composition, is fully described in an attractive brochure recently issued by John Bright Assoc., Inc., Ambler, Pa. Be sure to investigate the application of this material for base and subbase construction on highways, for low-cost temporary bypasses, and for airfield work where heat and fuel resistant paving is required. Check the coupon for your copy.

General Catalog Covers Process Instrumentation

138. A 12-page general catalog which illustrates, describes and gives basic specifications for Fischer & Porter Company's complete line of process instrumentation is now available. This convenient reference gives data on instruments for measuring and controlling flow, pressure, liquid level and other variables and transmitting, recording and integrating measures. Check the coupon for your copy.

MORE LISTINGS ON PAGES 34 TO 48

Comprehensive Catalog On Reflective Traffic Signs

82. Overall reflectorized signs surfaced with "Scotchlite" reflective sheeting and backed with aluminum—the combination for durability and 24-hour visibility are featured in a new publication offered by Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn. Check the coupon for your copy of this useful booklet.

Useful Attachments for "Payloader" Tractor Shovels

95. Increased versatility for Hough "Payloader" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc. Check the coupon today and full details will be sent.

12-54

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

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New Products, pages 130 to 134:

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Why not prove it to yourself that the Davis ***Pit-Bull*** is America's most versatile equipment. See how a low-cost tractor is converted into a powerful industrial unit. The ***Pit-Bull*** equipped with its bucket and scarifier will perform as good or better than conventional machines costing thousands of dollars more. Because of its compactness, the quick reversing features and the rear-end steering, the ***Pit-Bull*** has maneuverability second to none. Also consider the extra savings you make because of the other attachments that fit so easily onto the basic unit. It will be easy for you to understand why it can be your most economical investment in machinery without sacrificing your work capacity. The one-man operation will save you hundreds of dollars by eliminating idle equipment and man-power time. *Let a demonstration prove it!*

Ask Your Dealer for a Demonstration Today, or Write Direct and We'll Arrange It for You.

Here's the NEW Davis Loader for 1955

The greatest front end tractor loader value on earth. Now with more features than ever before, including lift rams with down pressure, rubber mounting with shock slots, double-strength lift arms, plus the other famous features that has made the Davis Loader America's Quality Loader. It fits all popular tractors.

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Please send me literature on the Davis Pit-Bull ☐ and literature on the Davis Front End Loader to fit a _____ model tractor. I would like a demonstration on the Davis Pit-Bull ☐

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To order these helpful booklets, check the coupon on page 32.

NEW LISTINGS (cont.)

Biofiltration Units for Small Scale Treatment

103. Complete sewage treatment on a small scale, suited for institutions, developments, turnpike restaurants and service areas and industrial waste applications is featured in Bulletin No. 7313 of the Dorr Co., Engineers, Stamford, Conn. Many engineering considerations are discussed, flowsheets show typical arrangements of units, and applicable units are illustrated in detail cutaway drawings. Check the coupon for your copy.

Aluminum Waste Receptacles Offer Many Advantages

140. The Mills aluminum waste receptacle for pedestrian use is both attractive and practical. The clean, streamlined design has a smart modern appearance, withstands hard use and never needs painting for protection. Easy to empty construction speeds servicing. Get all the facts from Mills Engineering Co., 672 So. Lafayette Park Pl., Los Angeles 5, Calif. Just check the coupon.

Helpful Reference Catalog on Waterworks Gate Valves

153. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive new 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the coupon.

Reliable Estimates of Smoke Density

160. The Smokescope, product of Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa., offers a reliable method for estimating smoke density. This data is the first requirement of an effective program for air pollution control. Find out how easy it is to take smoke density readings. Check the coupon for Smokescope data.

Data Offered on Elevated Steel Tanks

166. Attractive designs for elevated steel water storage tanks are shown in bulletins of R. D. Cole Mfg. Co., Newnan, Georgia. For copies of latest Cole literature check the handy coupon.

What You Should Know About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It . . . When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the coupon.

For Prompt Service

Use The Coupon

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the coupon today.

Helpful Data on Street Lighting Equipment

193. Complete data on Monotube street lighting lighting standards together with information on brackets, mast arms and accessory attachments is available from Union Metal Mfg. Co., Canton 5, Ohio. Be sure you have the latest data on street and highway lighting equipment. Check the coupon now.

How to Skidproof Icy Streets

195. Specific facts on how to fight ice in winter are presented in the leaflet "Melt or Skidproof Icy Surfaces with Wyandotte Calcium Chloride". Write Wyandotte Chemicals Corp., Wyandotte, Mich. or check the coupon.

•

STREETS AND HIGHWAYS

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

Handbook Covers All Soil Test Apparatus

24. Over 800 items of apparatus for engineering tests of soils, concrete and bituminous materials are described and illustrated in a new 72-page catalog published by Soiltest, Inc., 4520 W. North Ave., Chicago 39, Ill. All standard apparatus for field and laboratory engineering tests of soils are included. Get Catalog 53 by checking the coupon.

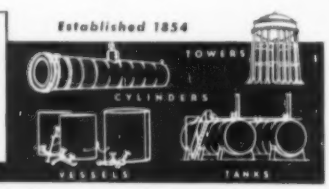
Faster Compaction On Street Repairs

108. Holes and trenches cut through pavement present difficult areas for compaction of backfill. Learn how to do the job quickly, easily and cheaply by using the self-contained, portable Barco Rammer. Full data on this low cost will be found in Bulletin 621. Write Barco Mfg. Co., 500 No. Hough St., Barrington, Ill., or check the coupon.

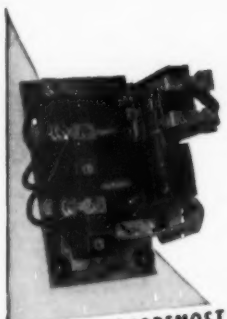
THE FIRST HUNDRED YEARS

FROM a small iron-works in 1854, we have been fortunate in growing to be one of America's largest metal fabricating industries . . . For the privilege of celebrating our Centennial, we express our appreciation for the friendship of four generations of customers, and the loyalty of four generations of workers.

R.D. COLE MANUFACTURING CO. NEWNAN, GA.



B/W All Electric Floatless... LIQUID LEVEL CONTROLS



Control variations in levels from ¼" upward. Remote control if desired — any distance. Controls unaffected by acids, caustics, pressures or temperatures.

Since 1933 B/W Controls have provided positive, dependable, economical liquid level control. No floats! No vacuum tubes! No moving parts in liquid.

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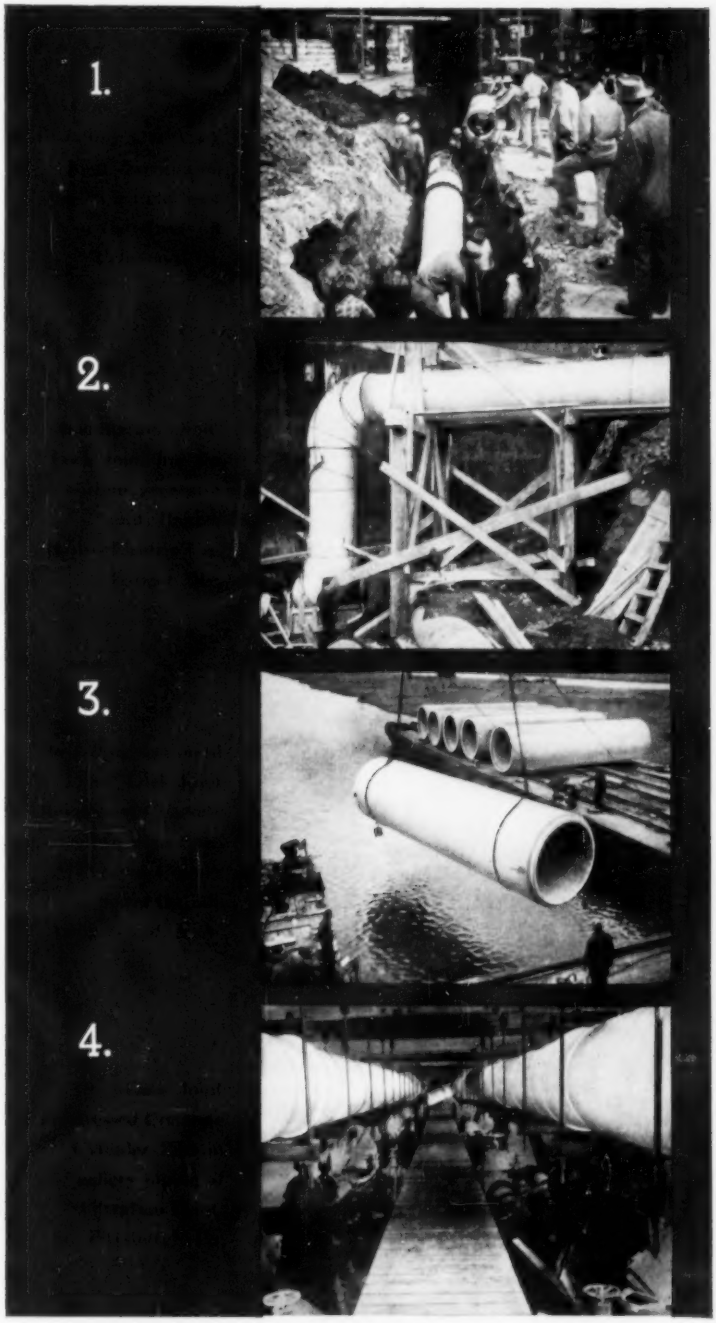

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the multi-purpose pressure pipe

Lock Joint Concrete Pressure Pipe has long been recognized as the ideal, high capacity pipe for water supply lines, but its variety of types and designs has also permitted successful use in the following:

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- INDUSTRIAL PLANT INSTALLATIONS (Supply, circulating and cooling systems)
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- WATER WORKS PLANTS (Pumping and treatment plant piping)
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THESE are some of the major services for which Lock Joint Concrete Pressure Pipe is ideally suited. So, if your pressure pipe problem involves pipe 16" in diameter or larger, call on Lock Joint – the low cost, high capacity, long lasting multi-purpose pipe.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16" in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

LOCK JOINT PIPE COMPANY

Established 1905

P. O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich., Columbia, S. C.

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LOCK JOINT *Reinforced Concrete* PRESSURE PIPE

Need more facts about advertised products? Mail your Readers' Service card now.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the coupon for your copies.

Think of Aerial Surveys When You Need Maps

311. Every engineer and public official should investigate aerial surveys for maps of new areas, up-to-the-minute maps for city planning, highway relocation, surveys to plan extensions of sewers, water mains and utilities. Precise contours for topographic maps and other data in any detail desired can be furnished by Aero Service Corp., 236 Courtland St., Philadelphia 20, Pa. Interesting booklet on aerial mapping services and methods available by checking the coupon.

For Prompt Service Use Coupon on Page 32

One Basic Unit with Attachments Does a Multitude of Jobs

149. You'll find full descriptions of the Davis Pit-Bull unit and versatile, easy-to-change attachments in the handsome new bulletin of Mid-Western Industries, Inc., 1009 S. West St., Wichita, Kans. There's a loader, trencher, dozer, roller, mower, rotary broom, post auger, crane, hammer and lift fork—units for every type of municipal maintenance and construction job—all coordinated for use with the same powerful basic unit. Be sure to investigate this remarkable equipment. Get the full story by checking the coupon.

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For sewer lines over 10", Flexible cleans up to 2,000 feet per day, using one operation, power driven bucket machines.

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Soil-Cement Information: Short-Cut Testing Procedures

159. A 12-page booklet entitled "Short-Cut Soil Cement Testing Procedures for Sandy Soils" is now available from the Portland Cement Assn., 33 W. Grand Ave., Chicago 10, Ill. Charts in the booklet are planned to reduce laboratory work for the scientific testing and control procedures developed by PCA. Get your copy by checking the coupon.

Your Property is Worth Good Protection

176. When installing chain link fence you want protection against rust and corrosion as well as vandalism. Investigate chain link fence made of "Konik" metal described in "Planned Protection" published by Continental Steel Corp., Kokomo, Ind.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clarke-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Hot or Cold Patching Mixtures Prepared on the Job

304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Layfette, Ind. or use the coupon.

Road Maintenance Equipment Covered in General Bulletin

306. Full specifications on the Gledhill line of road maintenance equipment, including graders of economical design, earth movers, roadside sprayers, snow plows and replacement blades, is covered in an illustrated bulletin available from the Gledhill Road Machinery Co., Galion, Ohio. Check the coupon for this convenient data.

How To Build Stabilized Heavy Traffic Pavements

233. A 16-page booklet published by Seaman Motors, Inc., Milwaukee, Wis., shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worth-while booklet for every highway engineer. Check coupon for copy.

Give Full Protection To Treated Poles and Timbers

267. Bolt holes in treated poles and timbers used for guard rails and structures can easily be the first point of decay. Now you can assure maximum life by using the Greenlee Bolt Hole Treater, a simple device that forces preservative into the wood cells. Bulletin 13-15 gives the details. Greenlee Bros. & Co., Rockford, Ill.

Design Data on Steel Sheeting Headwalls

283. An engineering data sheet showing the application of Armco Interlocking Type steel sheeting for headwalls of corrugated metal drainage structures is available from Armco Drainage and Metal Products, Inc., Middletown, Ohio. Suggested headwall designs and installation notes are included. Get a copy by checking the coupon.

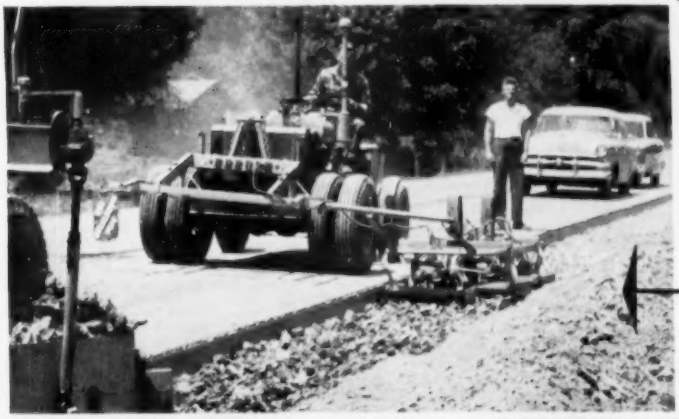
Windrow Loader is Tailor Made for Majority of Highway Needs

295. The peculiar problems of windrow loading require in most cases a medium capacity, low cost, highly maneuverable machine. To meet these needs Barber-Greene Co. now has a 4 cu. yd. per min. Windrow Loader, readily mounted on a wheel tractor. Further details may be obtained from Barber-Greene Co., Aurora, Ill. by checking the coupon.

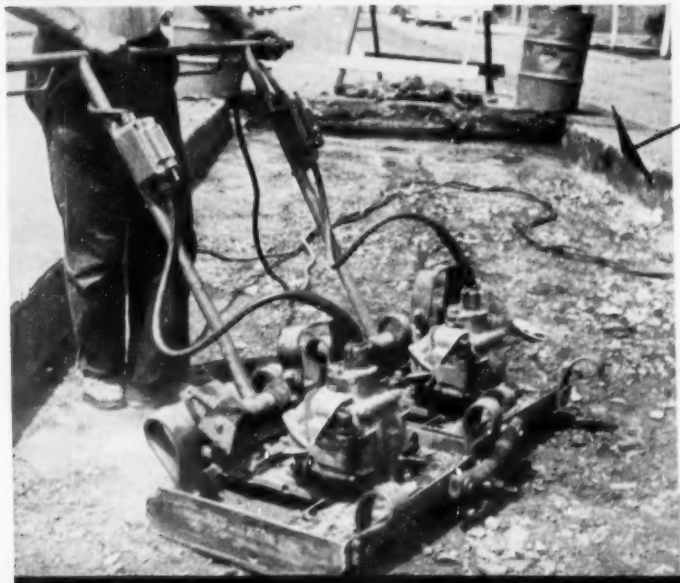
Best way to achieve SPECIFIED DENSITY in ROCK, SLAG, SOIL-BOUND MACADAM, GRAVEL and SAND BASE COURSES.. use

JACKSON VIBRATORY COMPACTORS!

On jobs such as this, soil-bound macadam — 5 inches thick, the JACKSON MULTIPLE COMPACTOR, ***now more powerful than ever,*** achieves specified density in JUST ONE PASS. It is equally efficient on rock, or slag base and all other granular soils.



Quickly adaptable to widening, the JACKSON MULTIPLE COMPACTOR is shown here consolidating slag macadam base course 36 inches wide and 9 inches thick. Using three of the machine's powerful compactor units in tandem, it readily obtains specified density in ONE PASS.



Twin hook-up of manually guided JACKSON COMPACTORS consolidating gravel base for a large pavement repair area. These machines, used singly or in tandem, or side-by-side twin hook-ups, are exceedingly efficient for all types of granular soil base and fill compaction; also for bituminous patching and driveway construction. Operated from a trailer-mounted JACKSON POWER PLANT which may also be used for other power tools and lights.

See your Jackson Distributor or write to us for complete information on these machines.

JACKSON VIBRATORS, INC. LUDINGTON, MICHIGAN

To order these helpful booklets, check the coupon on page 32.

CONSTRUCTION EQUIPMENT AND MATERIALS

8 Reasons Why You Should Check the Jaeger Loader

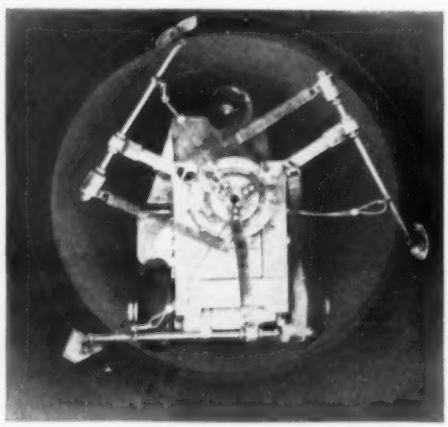
207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

Easy Reference on Durable Gratings and Treads

90. An easy-to-use catalog containing illustrations, descriptions and complete engineering data on grating-flooring, treads and floor armoring of riveted, press-locked and welded types has been published by Irving Subway Grating Co., Inc., 50-09 — 27th St., Long Island City, N. Y. To get this useful reference write to the manufacturer and ask for Catalog F400 or check the handy coupon.

Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection, and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.



In England with CENTRILINE

Here is another example of the growing, world-wide acceptance of the Centriline Process! In Manchester, England, a total of over 23,000 feet of 48", 90" and 99" *new* steel pipe is currently under contract to be centrifugally lined with cement mortar. Centriline in conjunction with John Mowlem & Co., Ltd., London, is handling the entire project for the Manchester Corporation Water Works.

On this project, brand new steel pipe is being Centrilined to guarantee indefinite pipe life. But Centriline is just as effective on old pipe . . . tuberculation and corrosion are eliminated forever . . . small holes are sealed . . . flow capacity is increased, pumping costs lowered . . . and the pipe is given a complete new lease on life. Follow the lead of water works officials around the world by turning to Centriline for the solution to *your* pipe problems.

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Now's the time to mail this month's Readers' Service card.

What You Should Know About Air-Placed Concrete

67. For a detailed explanation of the principle of "gunned" or "air placed" concrete and description of the improved Model 750 and 1250 Bondactors, be sure to get your copy of Form 553 from Air Placement Equipment Co., 1011 W. 24th St., Kansas City 8, Mo. Check the coupon today.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2125 Riverdale Ave., Port Chester, N. Y.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

Details on Motor Grader Construction and Use

312. In a handsome catalog, profusely illustrated with diagrams and photographs of unusually fine quality, the Galion Iron Works and Mfg. Co., Galion, Ohio, has presented all details on the construction and operating features of their Model 118 motor grader. This impressive 28-page catalog, No. 375, is available without charge. Just check the coupon.

REFUSE COLLECTION AND DISPOSAL

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I., N. Y. Check the coupon now to learn how your collection problems can be eased.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

"American Water Meters protected our investment by their low maintenance cost"

"We buy water meters as a 30-year investment. Naturally we want to protect our investment by keeping our meters in the best possible condition at the lowest possible cost. We've found that the exceptional simplicity of AMERICAN METERS has greatly reduced our maintenance expenses. Fully interchangeable parts are always available for AMERICAN METERS. We've found that true in using AMERICAN METERS for the past thirty years.

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Get full details of this month's products . . . mail your Readers' Service card today.

To order these helpful booklets, check the coupon on page 32.

Why Cities are Shifting to Pak-Mor Collection Bodies

216. Reduced costs of refuse collection with 12 to 50 yard bodies; faster loading; dense compaction; quicker emptying; sealed doors and simple controls are among the advantages cited in 16-page booklet describing Pak-Mor refuse collection equipment. Get full data from Pak-Mor Mfg. Co., Box 6147, San Antonio, Texas, or check the coupon.

Thinking of Sanitary Fill? Get This Booklet Now

285. Good management of sanitary landfills requires rugged, dependable equipment to excavate dirt, compact refuse and handle cover material. Such equipment, in use on landfill projects coast to coast, is featured in a new 8-page booklet titled "Community Workers," issued by the Caterpillar Tractor Co., Peoria 8, Ill. Check the coupon for a copy.

Check These New Features On Refuse Collection Bodies

383. The all-new Heil "Collectomatic" refuse collection unit incorporates the best features suggested by municipal operating crews, supervisors and private operators to provide easy loading, simple operating mechanism, bulldozer type packing, fast dumping and many other important advantages. Check them all by getting attractive Bulletin BH-54103 from The Heil Co., 3044 W. Montana St., Milwaukee 1, Wis. Your copy is ready—just check the coupon.

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using coupon.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., So. La Salle St., Chicago 3, Ill.

STREET LIGHTING

Investigate These Street Lighting Standards

366. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards by using the handy coupon. Check these strong, well designed, yet inexpensive steel standards for practical street and highway lighting. Handsome folder also includes data sheets on floodlighting and area lighting standards. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

SNOW AND ICE CONTROL

Uniform Salt and Cinder Spreading at All Speeds

93. Be sure to investigate the hydraulically operated ground drive offered by Baughman to give you the advantages of two drive speeds and uniform distribution of material regardless of truck speed, but without the need for power takeoff or transmission. Full data on this and many other features in Form A-380. Baughman Mfg. Co., Jerseyville, Ill.

Uniform Salt Spreading Saves Material

145. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Get Full Data On Aggregate Spreaders

286. Accurate control for spreading crushed rock, chips, sand or ice control materials is featured by all models of Highway Equipment Co. materials spreaders. Data on both trailer and tailboard types available by checking the coupon. Highway Equipment Co., 630 D. Ave., Cedar Rapids, Iowa.

Snow Plows for Every Street and Highway Need

335. For details on the full line of Frink Sno-Plows, including the new taper-type reversible plow with hydraulic roll-over control, reversible trip-blade plows, Vee plows and all accessories, check the coupon today. Frink Sno-Plows, Inc., Clayton, N. Y.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

AGRICAT SNOW PLOW SAVES MAN HOURS!

Man hours saved means doing the job faster at less cost! AGRICAT is small, versatile, ideal for "tight spot" snow removal jobs where larger equipment is too cumbersome and costly to use. AGRICAT . . . with its many attachments for year round operations . . . saves time, money and effort in scores of other ways, too! Don't take our word for AGRICAT'S adaptability . . . make us prove it! Call or write NOW.

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The NEW IMPROVED **NETCO CATCH BASIN CLEANER** WITH PNEUMATIC CONTROLS

A Necessity For Every Municipality

Easily mounted on any short wheel base truck with 8 ft. in back of the cab, the Netco can be operated continuously, averaging 20 to 30 catch basins a day. The Netco with its two powerful pneumatic buckets (orange peel or clamshell) is simple to operate, has a hoisting capacity up to 1500 lbs., and easily removes all debris through openings as small as 16 inches. *Send for our six-page descriptive folder.*

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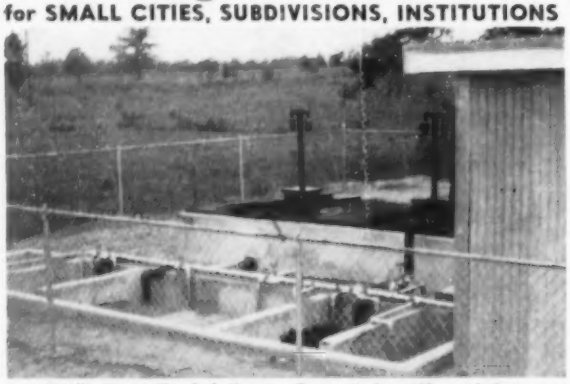

Hardin County Hospital, Kountze, Texas. Design: 150 population, 150 gal. per capita, 0.36 lb. B.O.D.

8 OUTSTANDING ADVANTAGES of which

7 *Contact surfaces will not clog.* Contact surfaces do not clog because of the continuous unloading from the vertical contact plates.

The 1 other big advantage is being told in other ads—or *For fully descriptive literature Engineers are invited to address:*

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Greenlee Bolt Hole Treaters
assure maximum life for poles, piles, timbers
Prevent decay around holes bored in new or old poles and timbers by pressure-treating each hole bored in the field. It's a simple operation with a GREENLEE Bolt Hole Treater. Treats the *entire* hole . . . forces preservative into all the wood cells around the bolt hole. Simply pour preservative in Treater cup until hole and cup are full. Pull back on handle, spring return does the work. Two models. Write for details. Greenlee Bros. & Co., 1752 23rd Avenue, Rockford, Illinois.
GREENLEE

Design Data Offered On The Spiragester

42. The Spiragester, a unit which combines the Spiraflo Clarifier and a digestion compartment in a two-level arrangement to save space and reduce construction costs, is fully described in Bulletin 124 released by Lakeside Engineering Corp., 222 West Adams, Chicago, Ill. Design details, including capacities for 8' to 24' units are furnished together with typical plan and elevation. Check the coupon for this helpful bulletin.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Specialized Service Reduces Sewer Troubles

64. The services of a firm experienced in the cleaning and maintenance of sewers for municipalities and industries are ready wherever and whenever you need help. To see how your community can save money on sewer maintenance get information on the facilities and know-how of Thomas Drain Service, 35 So. College St., Akron 8, Ohio. Check the coupon.

Effective Shredder For Dried Sewage Sludge

72. The rugged and compact Royer Sludge Disintegrator does a quick and effective job of preparing sludge for use as a fertilizer on city properties or for sale to others. Several models, portable and stationary, suitable for every size plant and power source are described in Bulletin 643-A, issued by the Royer Foundry and Machine Co., Kingston, Pa. Get a copy by checking the coupon.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers. Requests for this valuable booklet must be made on business letterhead.

A Short Course In Pipe Jointing

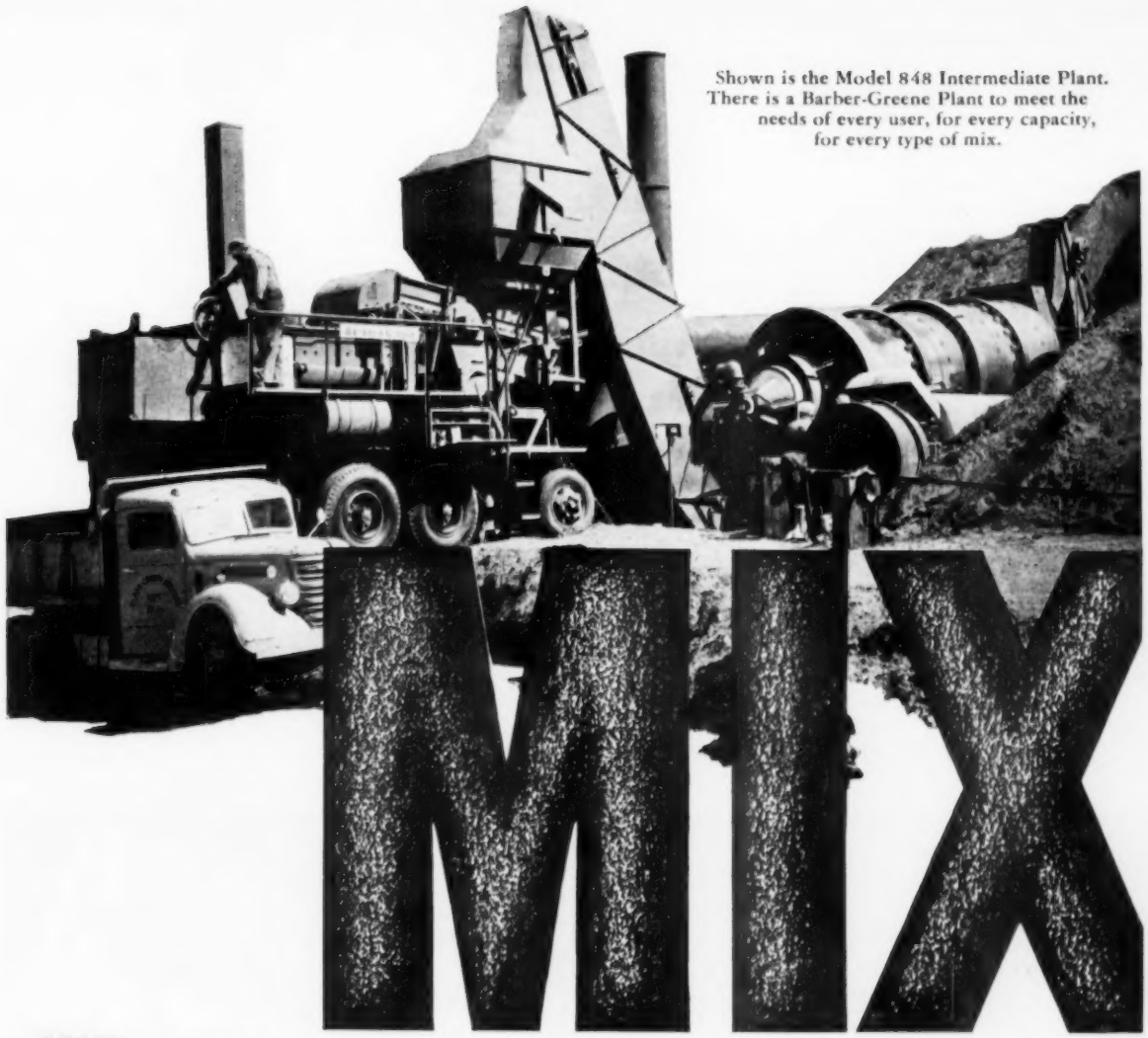
169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled, permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the coupon for free copy.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833-A. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Efficient Blowers for Activated Sludge Plants

232. Many advantages of Roots-Connersville positive displacement rotary blowers are described in Bulletin 22-23-B-13, which also provides characteristic curves for operation with constant speed, multi-speed and variable speed motors and details of several types of blowers. Get this helpful bulletin by checking the coupon. Root-Connersville Blower Corp., Connersville, Ind.



Shown is the Model 848 Intermediate Plant. There is a Barber-Greene Plant to meet the needs of every user, for every capacity, for every type of mix.

MIX profitably.

MIX more tonnage per season. **MIX** to meet all specifications.

MIX continuously, with the principle that is inherently automatic.

MIX with mechanically interlocked proportioning for the utmost uniformity.

MIX with the plant that is truly portable.

Let us show you how a Barber-Greene Plant can reduce your costs.

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Now's the time to mail this month's Readers' Service card.

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Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

Comminutors for Automatic Disposal of Coarse Sewage Solids

152. The problems connected with disposal of coarse sewage solids are eliminated by clean, odorless, automatic Comminutors. Full engineering data show the proper model for draulics and typical installations. Chicago every size plant and furnish details of hy-Fump Co., 622 Diversey Pkwy., Chicago 14, Ill.

Reference Book on Lubricated Plug Valves

273. Lubricated plug valves, including stick-proof lever sealed valves for easy operation and positive mechanical seal are fully described in reference books issued by Homestead Valve Mfg. Co., Box 550, Coraopolis, Pa. Check the coupon for your copy.

Get the Facts on The Contact Aeration Process

303. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the coupon to get the facts.

Inexpensive Ditcher Handles Heavy Digging

91. The Shawnee Scout Ditcher, a new heavier model for extensive digging has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas. Just check the coupon.

Chemicals Used in Water, Sewage and Waste Treatment

242. A 16-page technical bulletin offered by Omega Machine Co., 345 Harris Ave., Providence, R. I., compiles in convenient form full information on the chemicals, used in water, sewage and waste treatment. Data includes formulas, common names, commercial strengths, forms in which they may be obtained, sizes of shipping containers, and many other items, including recommendations for handling and feeding. Get this useful bulletin by checking the coupon.

Have You Heard About Bionetics For Sewage Treatment?

350. Bionetics, a dry staple powder of groups of living organisms preserved with enzyme systems, is available in several types to improve and accelerate the biological processes performed at sewage treatment plants. Get full data from Reliance Chemicals Corp., Box 6724, Houston 5, Texas. Just check the handy coupon.

Submersible Sewage Ejector Simplifies Installation

275. The Weil submersible non-clog sewage ejector is a compact unit with a completely sealed motor, available in several sizes with capacities up to 300 gpm. For details on unit selection, installation methods, construction features and controls get Bulletin SE-860A from Weil Pump Co., 1530 No. Fremont St., Chicago 22, Ill. Check the coupon.

Cleaning Service for Every Type of Pipe Line

302. Flexible Pipe Cleaning Co., operating with specialized equipment and trained crews, is prepared to remove scale, rust and other deposits from pipes for every type of service. For details and estimates furnished without obligation write Flexible Pipe Cleaning Co., Box 167, Los Nietos, Calif. or check the coupon.

WATER WORKS

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

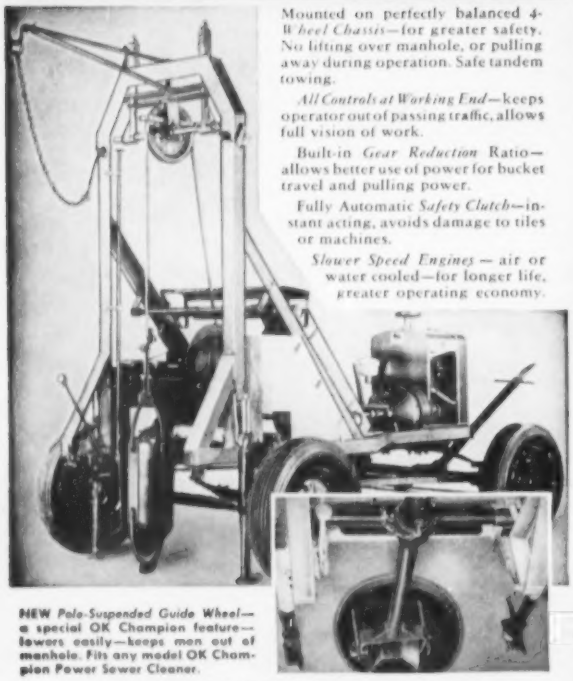
What You Should Know About Chemical Proportioning Pumps

38. In an attractive new bulletin you will find latest information on the Heavy-Duty Chem-O-Feeder, plus many installation diagrams, construction and operating details, list of chemicals fed and other helpful information on constant rate and flow proportional chemical feeding. Get your copy from Proportioneers, Inc., Providence 1, R. I., by checking the coupon.

Meters and Instruments For Water Works

43. An attractively arranged 20-page booklet issued by Sparling Meter Co., Box 3277, Los Angeles 54, Calif., furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the coupon for your copy.

OK CHAMPION POWER SEWER CLEANERS



Mounted on perfectly balanced *4-Wheel Chassis*—for greater safety. No lifting over manhole, or pulling away during operation. Safe tandem towing.

All Controls at Working End—keeps operator out of passing traffic, allows full vision of work.

Built-in *Gear Reduction* Ratio—allows better use of power for bucket travel and pulling power.

Fully Automatic *Safety Clutch*—instant acting, avoids damage to tiles or machines.

Slower Speed Engines—air or water cooled—for longer life, greater operating economy.

NEW *Pole-Suspended Guide Wheel*—a special OK Champion feature—lowers easily—keeps men out of manhole. Fits any model OK Champion Power Sewer Cleaner.

Write for latest OK Champion Circular

CHAMPION CORPORATION • 4752 **Sheffield Ave.** • **Hammond, Ind.**

NEW

LOW COST
ANTI FREEZING
3/4" COMPRESSION HYDRANT

MURDOCK Jr.

Made of Grade A Bronze and Grey Iron castings. Precision-machined to give decades of dependability. Thoroughly tested before shipment. Unexcelled for low-cost, all-weather service. Distributed by Plumbing & Heating Wholesalers.

Write for Catalog and Prices

THE MURDOCK MFG. & SUP CO. **CINCINNATI 2, OHIO**

OTHER MURDOCK PRODUCTS:

• HYDRANTS • STREET WASHERS
• FOUNTAINS • SHOWERS • VALVES

Pick up a

HOMELITE

and

SPEED UP

the Job

It's easy to get a compact Homelite gasoline-engine-driven generator out to a job, *no matter where the job is.* Take it out in a small truck, or jeep, or in the trunk of a car. Then, let your men pick it up and set it up right where you need action.

Instantly, you have the electric power you need to operate floodlights and power tools which greatly speed up work. Yes, and if yours is a Homelite Dual Purpose Generator you'll have high cycle power as well as 115 V.D.C. You'll have the power to run the newest in high cycle chain saws, grinders, drills, wrenches, concrete vibrators as well as your standard universal tools and floodlights.

Why not pick up complete information on how Homelites speed up a job? Send for our latest complete generator bulletin, now!

Manufacturers of Homelite
Carryable Pumps • Generators
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Canadian Distributors: Terry Machinery Co., Ltd., Toronto, Montreal, Vancouver, Ottawa.

Need more facts about advertised products? Mail your Readers' Service card now.

To order these helpful booklets, check the coupon on page 32.

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SAFETY, ECONOMY, DURABILITY,

Every Step of the Way.

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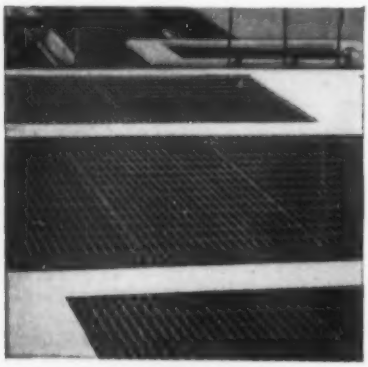
You're on SURE FOOTING with Versatile IRVING RIVETED, WELDED OR PRESSURE-LOCKED OPEN MESH FLOORING . . .



FOR: Walkways, Catwalks, Flooring, Draingrates, Stairways, Stair Treads.

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Specify IRVING GRATING for:

- ★ Light Weight
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IRVING SUBWAY GRATING CO., INC.

ESTABLISHED 1902

OFFICES and PLANTS at

5053 27th St., Long Island City 1, N. Y.
1853 10th St., Oakland 20, California

Instrumentation and Control For Water Filtration Plants

47. In a comprehensive 16-page bulletin, illustrated with 41 sketches of typical installations, Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I. presents data on the complete line of flow meters, gauges and rate of flow controllers for water treatment plants. For your copy of Bulletin 100-K2 write to the manufacturer or check the handy coupon.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included Check the coupon today.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 50 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, is available from Reed Mfg. Co., Erie, Pa. Check the coupon.

Modern Filtration for Swimming Pool Water

73. A colorful new bulletin that shows the operation of diatomite filters for swimming pool waters, outlines the advantages of this type of water treatment and provides helpful engineering data based on pool size has been published by R. P. Adams Co., Inc., 244 East Park Drive, Buffalo 17, N. Y. To get a copy, check the coupon today.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves. Check the coupon for this useful information.

Water Treatment Unit For Small Supplies

87. A complete-package water treatment unit to treat 5 to 100 gallons per minute is described in Bulletin 1870, issued by Infilco Inc., Box 5033, Tuscon, Ariz. Unit softens, clarifies, sterilizes or removes organic matter, tastes or odors. Requires a minimum of attention. Investigate this unit whenever dependable treatment is needed for small domestic supplies. Check the coupon today.

Locate Mains, Services and Leaks Without Digging

186. An 8-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes, cables, valves, manhole covers, conductive and non-conductive sewer pipes and septic tanks by electronic means. Dry battery operated. Only one man is needed for operation. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif., by checking the coupon.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

Vertical Turbine Pumps For Municipal Water Supply

121. Engineering data on vertical turbine pumps for deep or shallow well operation in capacities ranging from 50 to 10,000 gallons per minute, oil or water lubricated, are covered in a booklet issued by Worthington Corp., Vertical Turbine Division, Succasunna, N. J. Check the coupon today for this helpful information.

Pollution-Proof Outdoor Drinking Fountain

144. An outdoor drinking fountain so designed that contamination by cross connections or back siphonage is not possible is fully described in a 4-page bulletin. Features neat appearance, easy installation. Write Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio, or use coupon.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 4" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Engineering Data On Gravity Filter Design

170. The complete line of gravity filters and related accessories furnished by the Permutit Co., New York 36, N. Y., is covered in a well-illustrated 24-page booklet. Each element of a filter and filter controls are discussed in detail to assist the designer of these important units. Get your copy of this helpful publication by checking the coupon.

All-Electric Floatless Liquid Level Control

174. Description of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletins for engineering data, diagrams of typical installations and details of component parts. Check the coupon or write B/W Controller Corp., Dept. PW, Birmingham, Mich.

Non-Clogging Vertical Wet-Pit Pump Described

182. Full engineering data on Worthington "Freeflo" wet-pit pumps with non-clogging impellers capable of passing solids and stringy material are included in Bulletin W-317-B12. Check these pumps for sump, sewage and drainage service. Bulletin available from Worthington Corp., Harrison, N. J. Just use the coupon.

What You Should Know About The Centriline Process

197. The Centriline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered. Check coupon for your copy.

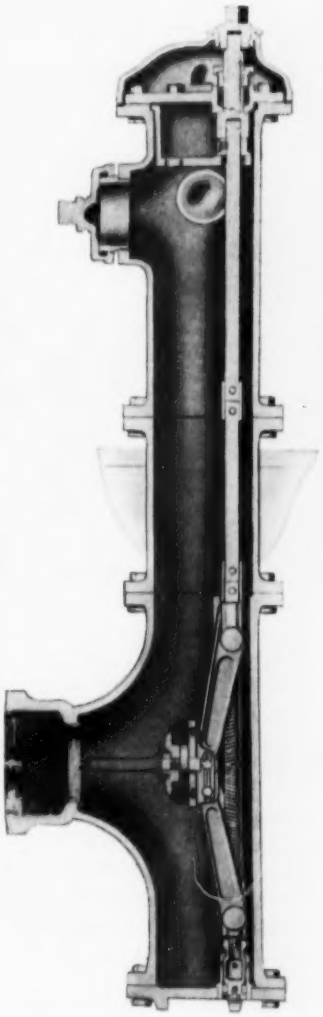
Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

22 Minutes

FOR COMPLETE HYDRANT INSPECTION

with Rensselaer



The illustrations show how easy it is to remove and inspect the entire mechanism of the Rensselaer-Corey Fire Hydrant which has been the standard in many cities for more than half a century.

The parts can be removed, inspected and replaced in twenty-two minutes. No digging for repairs or for standpipe breakage. This hydrant opens with the pressure, by means of the powerful knuckle joint. Easy to operate and cannot stick. It is quick opening with free flow long radius curves. Hydrant will not flood.

Ask for Catalog No. G and see why the Rensselaer-Corey Hydrant is preferred by superintendents, fire chiefs and maintenance men. 109

Rensselaer VALVE COMPANY, TROY, N. Y.

GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES • CHECK VALVES • AIR RELEASE VALVES

SALES REPRESENTATIVES IN PRINCIPAL CITIES

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

To order these helpful booklets, check the coupon on page 32.

Assistance in Planning Electrical Systems

189. On every water and sewage plant expansion, modernization or new construction job, you can get valuable assistance in planning the electrical system from Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Be sure to investigate compact, unitized Westinghouse equipment which conserves building space and simplifies maintenance. Check the coupon for full data.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the coupon or write to Chapman Valve Mfg. Co., Indian Orchard, Mass.

Are You Ready Now To Make Main Repairs?

214. Broken water mains can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Leaky bell and spigot joints are made lastingly tight with Skinner-Seal Bell Joint Clamps. Get Skinner Catalog 41 now—this handsome 40-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. Just check the handy coupon for your copy. M. B. Skinner & Co., So. Bend 21, Ind.

Investigate This Compact Flow Meter for Water

226. The Foster "Flow Tube" is a metering element that is compact and easy to install. Bulletin FT illustrates simple element containing nozzles for differential pressure production and shows capacity range and accuracy. Made in standard type sizes. Foster Engineering Co., Union, N. J. will send copy, or use coupon.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking coupon.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Helpful Data On Valve Boxes

291. Bulletin 35 issued by Buffalo Pipe & Foundry Co., Box 55, Sta. B., Buffalo, N. Y., gives full details on adjustable valve boxes, extension boxes and roadway boxes for water and gas. Get your copy by checking the coupon.

Automatic Cutter Saws Cast Iron Pipe

393. This portable automatic pipe saw, available with either pneumatic or electric drive, makes fast precision cuts in 8-in. to 60-in. cast iron or steel pipe. Features are light weight, minimum clearance required, easy operation even when submerged. Get details from H. R. Prescott & Sons, Inc., Worcester, Mass., by checking the coupon.

Complete Booklet on Pipe Line Equipment

246. Equipment for all types of jointing, maintenance and repair jobs on water, gas and sewer lines is described and illustrated in Catalog No. 25 issued by Joseph G. Pollard Co., New Hyde Park, N. Y. Leak detectors, pipe finders, melting kettles, cleaning tools, and a full line of hand tools for water and sewer departments, and many other items are included. Be sure to get your copy now. Just check the coupon.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, maneuverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

Complete Information On Fire Hydrants

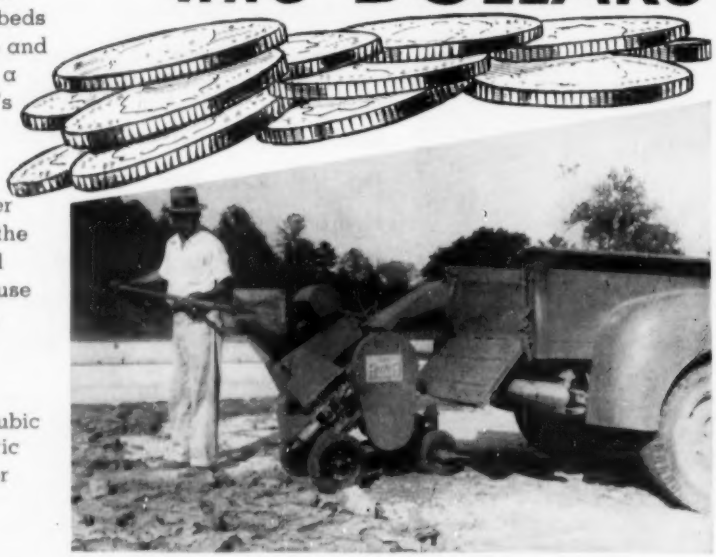
377. The 12-page Bulletin "G" of Rensselaer Valve Co., Troy, N. Y., contains complete information on design and operating features of the Rensselaer fire hydrant. Line drawings and sectional views show installation, servicing, spare parts and extensions as well as the "O" Ring Seal and mechanical joint ends that fit centrifugal cast, cast iron pipe and Class 150 Transite pipe. Get your copy by checking the coupon.

Process Your Sewage Sludge Into DOLLARS

It's a simple operation with the Royer Sludge Disintegrator. All you need do is feed the sludge direct from the drying beds into the hopper of this efficient machine and "dollars" are discharged in the form of a valuable, readily saleable fertilizer. It's as easy as that. No high installation costs; no skilled labor required.

The "combing belt" action of the Royer completely shreds, mixes and aerates the sludge, discharging a finely pulverized product, free of all trash. The ready-to-use fertilizer so processed is quickly sold to florists and nurserymen, golf clubs, gardeners, parks.

Available in capacities from 1 to 150 cubic yards per hour; gasoline engine, electric motor or belt-to-tractor driven. Send for bulletin giving details.



A Royer processing sludge in a Georgia sewage disposal plant.

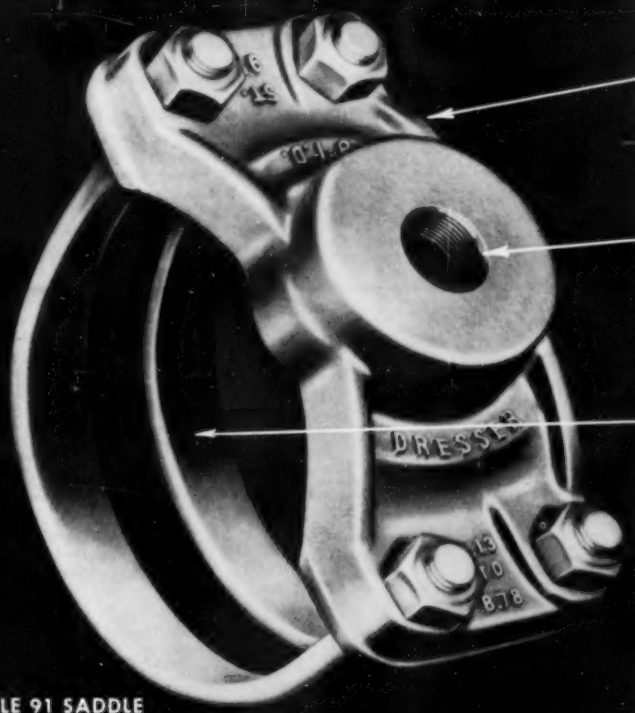
ROYER foundry & machine co.

157 PRINGLE ST., KINGSTON, PA.

ROYER

Now's the time to mail this month's Readers' Service card.

NOW AVAILABLE



HEAVIER CONSTRUCTION
Bodies designed with heavily reinforced sections, ruggedly constructed from Grade A malleable iron.

FULL TAPPING RANGE
Available with Corporation Stop Thread or IPS Thread taps to 2 inches in size. Large boss insures full threads.

FLAT STEEL STRAPS
Accurately shaped, high tensile steel straps conform to pipe. Wide, flat surfaces prevent cutting or crushing.

FITS RANGE OF PIPE
Fits steel, cast iron and asbestos-cement pipe within size range clearly marked on each saddle.

STYLE 91 SADDLE
(6" ID)

NEW DRESSER SERVICE SADDLE
...designed for long, rugged service

The new Dresser Style 91 Service Saddle has been carefully designed for maximum dependability, economy and ease in making service connections.

The body of the saddle is heavily constructed with a Dresser gasket of time-proven Grade 27 compound securely cemented in place. Cold-rolled threads give the bolts greater strength and added resistance to corrosion.

Style 91 Saddles are heavily galvanized or protected with Dresser's new plastic dip. This coating covers all threads as well as saddle surfaces, has dielectric strength, will not "plate out". Saddles are packaged for convenient handling and storage.

Order a stock of Dresser's new, economical Style 91 Saddles from your local waterworks supplier today, or write us!

DRESSER®

Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales Offices also in: New York, Philadelphia, Chicago, Toronto.

Get full details of this month's products... mail your Readers' Service card today.

Greater Economy...

More Versatility in Street or Highway

STAGE CONSTRUCTION with a SEAMAN MIXER

Low cost stabilization of native soils with the SEAMAN Self-Propelled Mixer.

STAGE 1. To improve a light traffic county or township road . . . or to make streets in new subdivisions, the SEAMAN MIXER will mix and blend the native soils already in place. This achieves a uniform soil reaction to moisture and provides a smooth, weather-durable base. Construction costs and maintenance are low.

A "black earth" road stabilized at low cost by mixing in 0.5 gallons of oil per inch of depth with the SEAMAN MIXER.

STAGE 2. Next year? Or the next? As traffic grows heavier, scarify the old stabilized base and utilize your SEAMAN to mix in any suitable fluid or dry additive. The SEAMAN MIXER provides the most thorough, uniform distibution of binder and the highest densities after compaction.

A gravel highway with excellent load-bearing and weather resistant characteristics by correct assembly of materials with the SEAMAN MIXER.

STAGE 3. Traffic flow and weight increasing? Now lay gravel or crushed stone on the Stage 2 suface and mix it with the PULVI-MIXER.

Thus you take advantage of the thickness of the previously stabilized base — moreover, with the SEAMAN you correct segregation in the new aggregate by blending the coarse and fines, interlocking and mortaring-in the stone in the most efficient *assembly* of those materials.

High type of gravel-asphalt stabilized for a city street. SEAMAN TRAV-L-PLANT is mixing, blending and properly assembling materials for maximum density.

STAGE 4. When traffic volume demands, scarification of the gravel-stabilized course and re-mixing with bituminous binder or cement provides the community with a high type of heavy duty, low upkeep pavement. And it is achieved at a minimum of cost because you have re-used the aggregate already in place.

Properly assembled materials resist wear by traffic. Only the SEAMAN MIXER properly mixes, blends and assembles the coarse and the fines to build a base which is highly durable, resistant to penetration and break-up from frost. And only with the SEAMAN can you accomplish this within the limits of the most modest budget.

The principle of SEAMAN mixing, together with a complete description of the SEAMAN MIXERS is shown in this recently issued Bulletin. Many job scenes illustrate the text. Write for Bulletin TPS.

SEAMAN MOTORS Inc.

266 NORTH 25TH ST.. MILWAUKEE, WISCONSIN

The SEAMAN TRAV-L-PLANT 7 ft. mixing width, gasoline or diesel powered. Equipped with pump, tachometer controls, volumetric meter and spray bar for admixture of bituminous materials or water.

Need more facts about advertised products? Mail your Readers' Service card now.

Save up to 60% of floor space

with

JOHNSTON Vertical Turbine PUMPS

and reduce maintenance and operating costs!

Here is why rugged, economical Johnston Vertical Turbine Pumps are used for municipal water supply by the City of South Gate, California and are preferred by experienced municipal engineers everywhere. Vertical design saves up to 60% of floor space. They fit in tight places where space is at a premium. No need for costly priming devices—Johnston Pumps can be installed to start and stop easily and require no priming. Low maintenance and operating costs—measured dollar for dollar per year of service, make Johnston Pumps the most economical you can buy. The Johnston dealer in your area will gladly confer with you on your pumping problems. Write for details.

JOHNSTON VERTICAL PUMPS

☐ Kindly send colorful, illustrated bulletin ☐ Have representative call

JOHNSTON PUMP COMPANY
Founded in 1909
Bin "K", Pasadena 15, California

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Address_____
City_____ State_____

PWM-124

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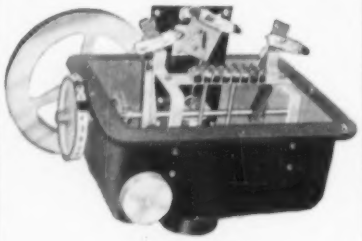
ROTO-TROL



RF-2
with ALTO-TROL

Puts that second pump to work.

A 2-pump RF-2 ROTO-TROL with a built-in ALTO-TROL will operate each pump on alternate starting cycles, assuring equal use and wear of both pumps. Operates both pumps when required. FLOAT-CONTROLLED. Depth Indication optional — extra.

Write for full data.

Water Level Controls Division

HEALY-RUFF Company

791 Hampden Ave., St. Paul 4, Minn.

FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...

SKINNER-SEAL
Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band — at spigot by hard vulcanized gasket tip. 2" to 42".

AND BROKEN MAINS

SKINNER-SEAL
Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 800 lbs. line pressure. A lasting repair. 2" to 24" incl.

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA, U.S.A.

People, Ideas and Events

BY "DOC" SYMONS

H.T.M.A. — And let me be the first to wish you a Merry Christmas and a Happy and Prosperous New Year—just as I did a year ago.

★ ★ ★

The King is Dead—Long Live the King—or something like that. The Federation meeting at Cincinnati was saddened to hear that W. H. (Pete) Wisely had resigned as the Federation Executive Secretary and Editor to become Executive Secretary of ASCE, to replace Col. Carey who retires May 1.

At the final Federation Board meeting, the Board approved the recommendation of a selection committee for Wisely's successor. Chosen to fill the position was Dr. Ralph E. Fuhrman, Deputy Director of Sanitary Engineering District of Columbia, Washington, D. C. Dr. Fuhrman was formerly Supt. of Sewage Treatment of the Washington, D. C. plant and is a past president of the Federation.

I think Washington, D. C. is the only loser in this switch and both boys have the best wishes of everyone for a bright future for themselves and their respective organizations.

★ ★ ★

It Was Bound To Come—Televiewers all over the country have been applauding Art Carney of the Jackie Gleason Show and Art's devastating satire of a sewer maintenance man together with his "Song of the Sewer". Included in this enthusiastic audience are countless sewage works men.—Little wonder then that some sewage group would "honor" Art Carney—as witness this award—

"KNOW YE ALL MEN BY THESE PRESENTS:

WHEREAS: The profession of Sewage Maintenance is not odornarily speaking, a bed of roses, and

WHEREAS: This type of business is most efficiently administered when it is "in the hole," and

WHEREAS: Deep appreciation for the efforts of the various personnel is sometimes sluggish, and

WHEREAS: The following of this pursuit takes a lot of grit in order to float with the trend, and

WHEREAS: A fresh and distinctive air has been added to American Musicana known as "THE SONG OF THE SEWER" which has become the "national Anthem" of the thousands of sewer men all over the United States.

Therefore be it known:

That ART CARNEY of the Jackie Gleason Enterprises has done much to bring this dark subject to light and has caused users of these hidden facilities to realize that Sewer Maintenance is not to "be sniffed at."

We therefore present to the said ART CARNEY with sincerest gratitude an Honorary Life Membership in the Los Angeles Sewer Maintenance Section of the California Sewage and Industrial Waste Association. Any and all members of this organization pledge themselves to "hold up the lid" anywhere and at any time for ART CARNEY".

This was signed by the Section officers headed by Norris Bravender, Chairman and attested by the State officers headed by Alvin A. Appel, President.

The certificate was presented by Louis Fontanelli, immediate past president of The Federation of Sewage & Industrial Wastes Associations, during a rehearsal of the Gleason Show.

★ ★ ★

Swedefinition — "Autumn" — When neither the heat nor the air conditioning is turned on.

★ ★ ★

Business cards I received at Cin-

"East Side Plant"—first of 2 new sewage treatment plants for Evansville, Indiana

Evansville joins Ohio River clean-up program

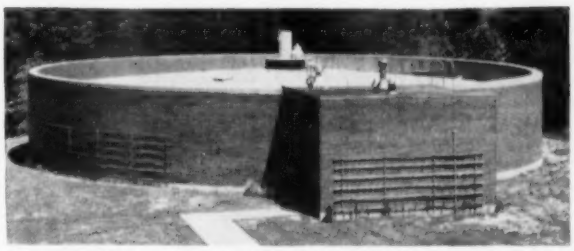
TWO-PLANT, 28 MGD PROJECT INCLUDES PFT "CONTROLLED DIGESTION"

At Evansville, Indiana, the first of two proposed primary treatment plants is completed . . . another stride forward in the 8-state Ohio River Valley clean-up program! Called the "East Side Plant" the new 6 MGD plant adopted PFT equipment for modern "controlled digestion".

The new 75′ digester is equipped with a *PFT Floating Cover* for simplified operation, positive scum submergence and safe utilization of gas. The digester is also provided with a *PFT Supernatant Liquor Selector* for automatic, continuous withdrawal of the best digester liquor. A *PFT Gauge, Sight Glass and Sampler* unit enables operator to keep close control of supernatant.

An important feature of Evansville's "controlled digestion" is the *PFT Digester Heater & Heat Exchanger*, an external heater with a capacity of 750,000 B.t.u. per hour. Fired by either gas *or* oil, it utilizes all sludge gas produced, switching to oil only when necessary.

In the control building attached to the digester, a *PFT Cover Position Indicator* records the digester liquid level at a glance. *PFT Gas Safety Equipment* in the building includes flame cells, flame traps, pressure relief with flame trap, gas pressure gauge and a waste gas burner.



New 75′ Digester with PFT Floating Cover

Contracts have recently been let for the "West Side Plant", a 22 MGD plant designed to serve a population equivalent of 212,000. Specifications for "West Side" call for the following PFT equipment: four 75′ Floating Covers; three 8″ Rotary Sludge Withdrawal Valves; two Heater & Heat Exchanger units; four Cover Position Indicators; four Supernatant Liquor Selectors; four Supernatant Gauge, Sight Glass & Sampler units; various items of Gas Safety Equipment.

Design of plant by / *Consoer, Townsend & Associates, Chicago, Illinois*

P.F.T.

waste treatment equipment exclusively since 1893

PACIFIC FLUSH TANK CO.

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No. 3* of . . .

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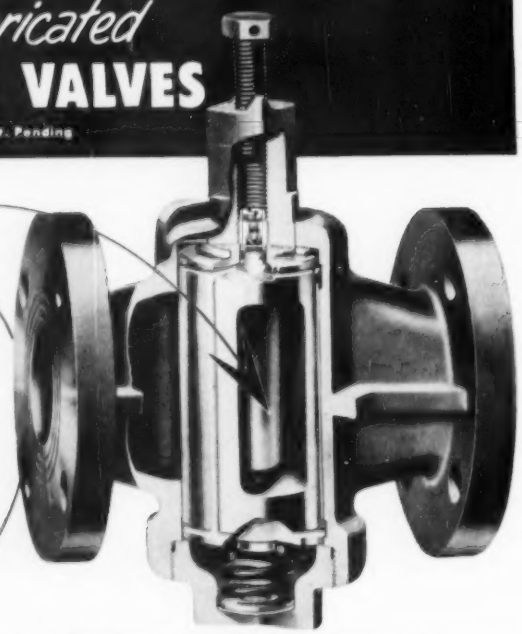
PLUG VALVES
Pat. Pending



*AVAILABLE IN 100% PIPE AREA AND VENTURI PATTERNS

Insist on 100% pipe area **HOMESTEAD LUBRICATED PLUG VALVES** to avoid costly pressure losses. If a slight restriction is unimportant, worthwhile savings can be made by using our Venturi type valve.

Your choice of ports is only **ONE REASON WHY** you should buy and use, *low priced* **HOMESTEAD LUBRICATED PLUG VALVES.**

HERE ARE ALL TWELVE

1. Reinforced Teflon packing ring.
2. Completely controlled high-pressure lubricant system.
3. 100% pipe area and venturi patterns.
4. No spring torsional stress.
5. No mechanical adjustments.
6. Two lubricants handle most services.
7. Extremely close tolerance between sealing surfaces.
8. Triple head-seal with Lubricant and Teflon packing ring.
9. Plug floated on Teflon surfaces.
10. Leak-proof, double-ball-and-lubricant-sealed check valve.
11. Full-threaded screw assures clean lubricant.
12. Extruded lubricant shows a full protecting system.

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cinnati included: Wellington Donaldson, Staff Consultant, Parsons, Brinckerhoff, Hall & Macdonald, Cons. Engrs., New York City.

John M. "Mike" Fisher, Jr., Dixie Division, Armco Drainage & Metal Products, Inc., Atlanta, Ga.

The former is New York City's own "Duke" Donaldson who retired a short while back and lucky are P, B, H and M to obtain the benefit of his long experience.

The latter, I predict, is a name that will be far better known one of these days. "Mike" is not only a Sanitary Engineer but is a trained minister and missionary as well. If he never takes these talents to underdeveloped areas, I expect the industry he serves in this country will get great benefits from this dual training.

★ ★ ★

More House Organs — Good, Too! —First issue of the "Jersey Outfall" of the N.J.S.I.W.A. was published last July. Editor is Eugene H. Trubnick.—From it I learned that in Altoona, Pa. the sewage service charge is 120 percent of the water charge.—Also I learned that the APHA has listed 86 zoonoses or diseases naturally transmitted from animals to man.

"News Leaks" is the title of the house organ published by the Indiana Section of AWWA.—I don't know who edits the sheet.

"Aquafacs" is the house organ of the Division of Water, Sewage and Sanitation Chemistry of the American Chemical Society. My guess is that T. E. Larson, of the Illinois State Water Survey Div. has something to do with this publication.

★ ★ ★

Luminous Quote — When Charles Kettering was asked why he was so intensely interested in the future he replied, "Why shouldn't I." "I expect to spend all the rest of my life in it."

★ ★ ★

News Notes From Brushy Bend—A joint meeting of the Metropolitan and Long Island Sections of NYSIWA was held on September 28th. The meeting included an inspection of the Bay Park Sewage Treatment Works at East Rockway, L. I., (Anton Sparr, Supt.) and a dinner at Rockville Centre, L. I. R. H. (Dick) Gould, formerly Dir., Div. of Serv. Disp. N. Y. C. and now with Greeley & Hansen, Engrs. was guest speaker.

—West Shore Water Producers

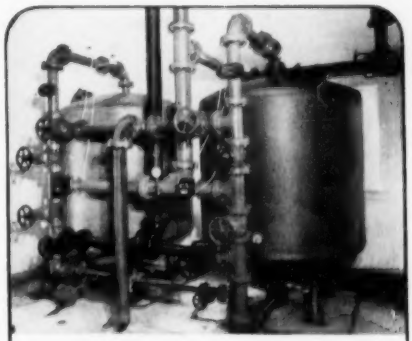
How Martinsville gets iron-free, soft water

Martinsville, Illinois Municipal Water Plant. Constructed in 1950.

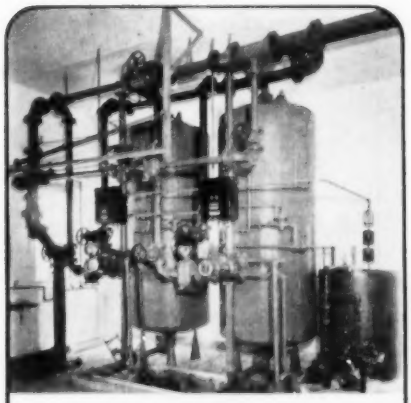
MARTINSVILLE'S untreated well water was very hard . . . an extremely wasteful nuisance!

Its 269 ppm of total hardness ruinously scaled pipes and water heaters. And further annoyed citizens by wasting soap, leaving unsightly rings around bathtubs, sticky curd on dishes and laundry. Iron of 2 ppm—which gave the water an unpleasant metallic taste—caused objectionable stains on plumbing fixtures and laundered fabrics.

These troubles were ended when Martinsville installed the Permutit equipment shown. On a recent check, we asked for the operator's opinion of our equipment.



Compact Permutit pressure filters have a 150 gpm capacity...remove iron oxidized in coke-tray aerator, reduce turbidity.



Permutit softeners remove hardness, further reduce iron to 0.02 ppm! Automatic regeneration saves time . . . provides constant supply of softened water.

Mr. O. Wiser—who is in charge of the Martinsville Municipal Water Plant—reports: "The Permutit equipment is very good . . . has worked very well with very little maintenance."

Free Technical Bulletins

Write today for full information on any water conditioning process or problem. THE PERMUTIT COMPANY, Dept. PW-12, 330 West 42nd Street, New York 36, N. Y.

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WATER CONDITIONING HEADQUARTERS FOR OVER 40 YEARS

The new Delaware pool in the Town of Tonawanda, N. Y., is so popular that swimmers are admitted in shifts — 300 strong. Despite this heavy load, Adams filters keep the water glistening clean.

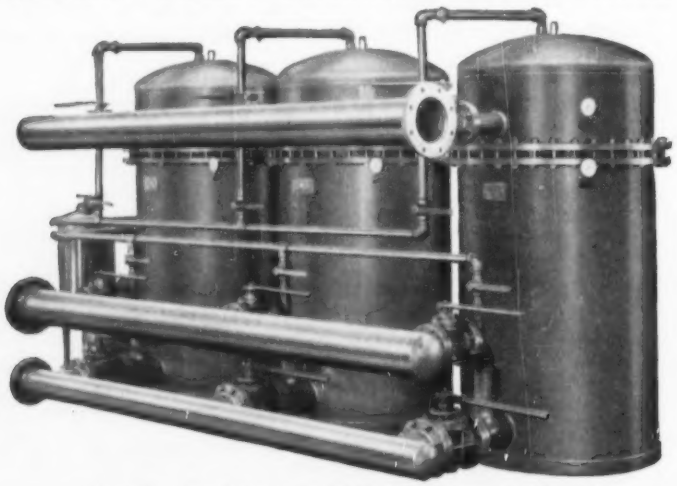
It's easy to keep your pool water Crystal Clear at Lower Costs

Hundreds of swimming pools across the nation have found that Adams filtration packages are the right answer. That's because of the advanced engineering design . . . diatomite filtration . . . permanent Poro-Stone elements . . . compact installation . . . simple operation featuring a new backwash technique.

We have a wide range of filters and delivery is prompt. You'll find the price of crystal clear water for your pool is amazingly low, so write for complete information, today.

ADAMS *SPF*...

TODAY'S FINEST SWIMMING POOL FILTER



Adams filter installation at Garfield Park Pool, Grand Rapids, Mich.

R. P. ADAMS Co., Inc. 228 EAST PARK DRIVE BUFFALO 17, N. Y.

Thousands use our Readers' Service card to keep up to date . . . do you?

Association met on October 13th at Chicago at the South Side Filter Plant, where John Baylis spoke after dinner on "Use of Butterfly Valves to Solve Leakage Problems in Filter Wash Water Valves."

—Relly Clark, that Water Works Specialty Salesman of Avon, N. Y., held his annual Water Works meeting on October 14th. Always a good crowd from Western N. Y. at these functions.

—October 19th saw a meeting of the Metropolitan Water & Wastes Society at Columbia University School of Public Health. The topic was "Reuse of Sewage Plant Effluent". Speakers included Harry Fabor of *Water & Sewage Works*, Phil Baggish of Ebasco and "Bob" Keating of Graver.

—October 19th also saw a meeting of the Central Section of Sewage and Industrial Wastes Works Operators of Illinois at Rantoul, Illinois. Biocatalysts, water-softening sludge, filter flies and grit removal were discussed.

—October 20th was the meeting of the Northern Section of the Sewage & Industrial Waste Works Operators of Illinois held at Grayslake, Ill.

—October 20th also was the date of the fall meeting of the Westchester Water Works Conference in Hartsdale, N. Y. Speakers included Dr. George E. Symons (Fluoridation), Simon P. Carmon (AWWA) and Wayne Heydecker (Planning).

—October 26th the Long Island Water Conference met at Lincks at Centerport, L. I., N. Y.

—October 27-28th the 23rd Annual Water Plant Operators' Conference was held at the Leland Hotel in Springfield, Ill. Topics included Cloud Seeding, Beautification, Instrumentation, Retirement Systems, Laboratory Control and group sessions on ground and surface waters.

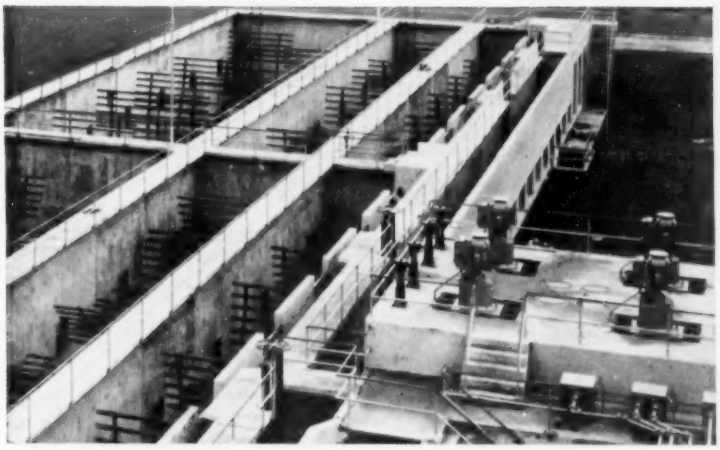
V.T.Y.—Doc Symons

• • •

To Inspect 5000 Housing Units Per Year in Dayton

The proposed housing code for Dayton, Ohio, provides for the establishment of a housing inspection and slum prevention bureau made up of a chief and four inspectors. This staff is expected to inspect 5,000 units a year, completing checks on the city's 20,000 sub-standard dwellings in about four years. Of Dayton's 70,000 dwellings, some 40,000 were built before 1920 and 16,000 before the beginning of the century.

Fast-growing Houston called on JEFFREY for dependable water treatment equipment



Jeffrey sanitary engineering and equipment can be applied effectively to any American city with "growing pains and a thirst."

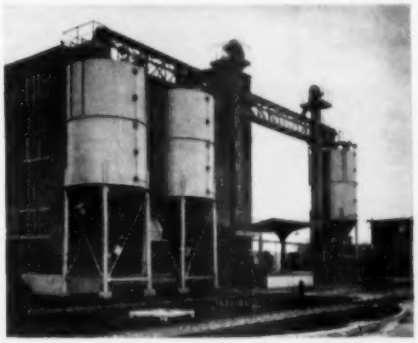
Jeffrey's broad experience in the design and construction of sanitation systems covers all types of installations. You can turn your sanitation problem over to Jeffrey with complete confidence.

Hundreds of water, sewage and industrial waste plants throughout the nation are now Jeffrey-equipped. The complete Jeffrey line for Water Treatment Plants includes:

- Bar and Disc Type Screens
- Screenings Grinders
- Grit Collectors & Washers
- Sludge Collectors
- Sludge Elevators
- Scum Removers
- Power Transmission Machinery
- FLOCTROLS
- Dry Feed Chemical Machines
- Biofiltration Plant Equipment
- Garbage Grinders
- Belt and Spiral Conveyors
- Bucket Elevators
- Chains and Sprockets

Write for Catalog 833-A

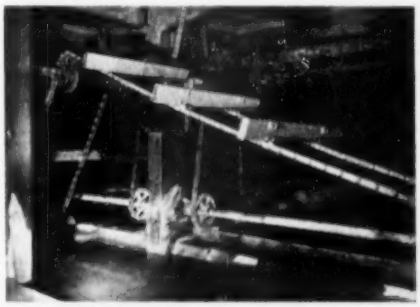
Below: A complete chemical handling system utilizing Jeffrey Power Scoop, Spiral Conveyors and Bucket Elevators. Material flows uninterrupted from cars to storage bins or chemical feeders.



At left: 14 Jeffrey FLOCTROLS, each 54' long, driven by 1½ hp. motor, have peripheral paddle speed of 1.2 to 1.8 ft. per second . . . 45-minute detention at 80 mgd. Note four Jeffrey Rapid Mixers at right.

Below: Jeffrey Spiral Conveyors carry chemicals from storage bins by bucket elevators to chemical feeders.

Below: Close-up of Jeffrey Sludge Collectors in action in the settling tanks of Indianapolis Water Co.'s White River plant.



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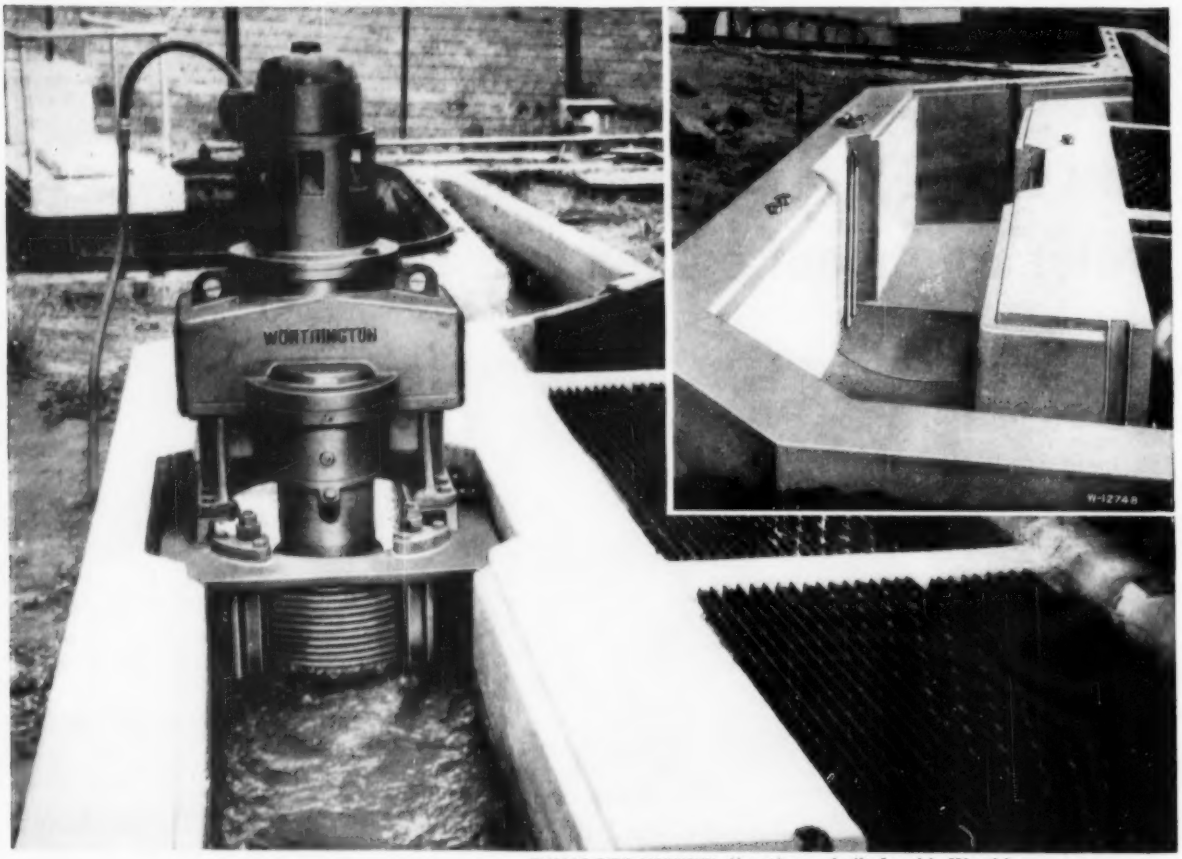

SIMPLE SIDE CHANNEL (inset) was built for this Worthington comminutor at Klamath Falls, Oregon, because Mr. E. A. Thomas, the City Engineer, wanted to use the existing channel as a by-pass.

Low installation cost swings Klamath Falls to Worthington

Since the Worthington comminutor is designed so that raw sewage flows straight through its screen, it's easily installed in a straight rectangular sewage channel.

Result? Expensive masonry work is not needed, which makes for simplified, low-cost installation.

This was an important factor in the selection of a Worthington 25C6 comminutor as part of recent improvements at the Klamath Falls, Oregon, Sewage Treatment Plant.

This comminutor, installed downstream from a grit chamber and upstream from a clarifier, was lifted directly from its packing crate and set right in the channel in a minimum of time.

Easy-to-remove cutter racks for occasional sharpening and the built-in flood protection provided by a mercury seal are other advantages of the Worthington comminutor.

Get all the facts and figures on the rugged Worthington comminutor. Check with your nearest Worthington district office. Or write today for new engineering manual on comminutors, W-317-B17. Worthington Corporation, Public Works Division, Harrison, N.J.

W.4.5

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ALL MAJOR PUBLIC WORKS EQUIPMENT UNDER ONE RESPONSIBILITY

Water Works Pumps • Sewage Pumps • Comminutors • Vertical Turbine Pumps • Vacuum Pumps

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PUBLIC WORKS DECEMBER

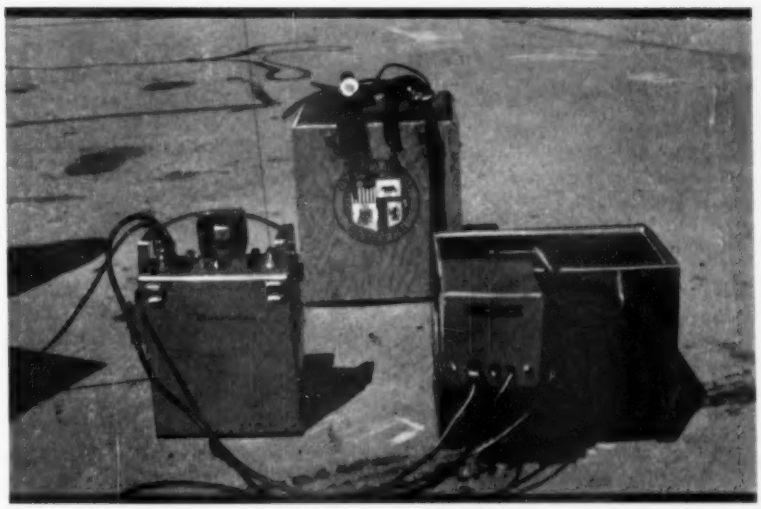
How WALKIE-TALKIES Help in SEWER and STORM DRAIN MAINTENANCE

ALVIN A. APPEL,

Superintendent of Sewer Maintenance,

Los Angeles, Calif.

The Sewer Maintenance Division of the City of Los Angeles is responsible for the inspection, repair, and cleaning of approximately 4000 miles of main line sewers varying in size from 8-inch circular to 10-ft. by 12-ft. semi-elliptical. In addition it is also responsible for the general maintenance of a separate storm drain system, approximately 800 miles in length, ranging in size from 12-inch circular to 10-ft. by 15-ft. box sections constructed in place. The locations of many of the older sewer and storm drain lines within this system were originally designed to follow generally the natural drainage of the terrain as considerable of the land areas were then unoccupied. By obtaining easements and waivers, savings in cost of construction were made by not designing the lines to follow possible future street locations. In subsequent years these open areas were sub-divided into residential properties and improved by the construction of thousands of homes—one of the manifestations of the tremendous growth of the City. Field maintenance crews found it increasingly difficult to inspect and clean many of these lines due to the fact that personnel operating equipment at one manhole were unable properly to contact the crew working at the next manhole because of intervening buildings or landscaping.

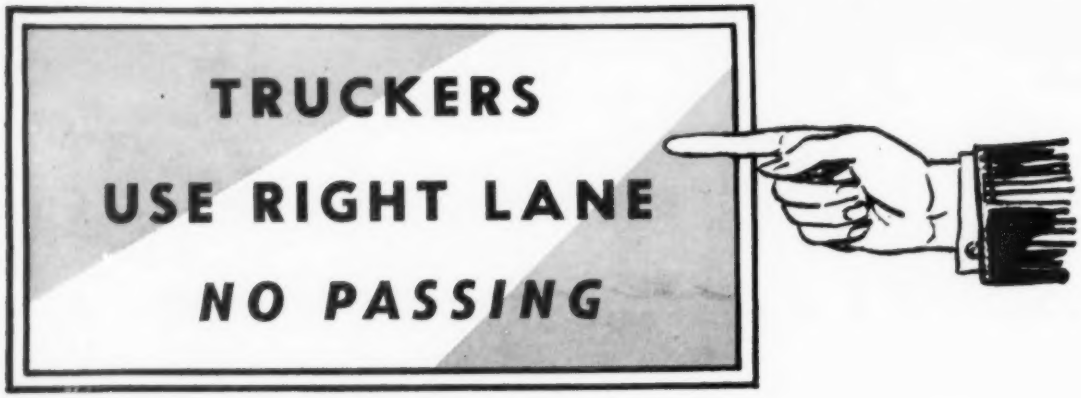


● **CLOSE-UP** view of the equipment used to speed up sewer maintenance work.

The use of Walkie-Talkies in such locations has provided immediate and positive contact between the two operating crews. This equipment has also contributed directly to a more efficient operation and to considerable saving in man-hours per job undertaken.

The Division is further faced with a most difficult problem of cleaning in that the 55-mile long Outfall Sewer and many contributary trunk lines must cross the Los Angeles River channel through siphon structures at numerous locations. Many of these structures vary from 300 feet to a 1000 feet in length and personnel operating at each terminus of the siphon have previously found such cleaning operations most difficult and hazardous as immediate contact is a necessity in case the cleaning tool should become lodged in the siphon barrel being cleaned.

(*Continued on page* 128)



TRUCK CLIMBING LANES

HERBERT R. PERKINSON, JR.,

Associate Traffic and Planning Engineer,

Virginia Department of Highways

THE greatest challenge facing highway administrators today is that of providing, from the limited revenues available, highways that will carry the ever-increasing volumes of traffic at reasonable operating speeds. As a solution to capacity problems at selected locations, Virginia is employing a relatively new and economical device—the truck or climbing lane.

Climbing lanes are normally constructed on existing two-lane highways where large volumes of heavy trucks must ascend sustained grades, or where combinations of steep grades and poor alignment seriously retard the free flow of vehicles. The lanes are 10 to 12 feet in width and are of normal pavement design. While color contrast with the regular lanes is desirable, it is not essential.

Highways with truck lanes are clearly marked with pavement lines and regulatory signs to allot two definite lanes to upgrade traffic, with the heavy, slow-moving vehicles being directed to use the right, or outside, lane. As all traffic moves downgrade at relatively uniform speeds, these vehicles are funneled into a single lane by standard barrier markings near the crest.

Commercial vehicles reduce the traffic-carrying abilities of highways, since they occupy a greater road space and influence traffic over a larger area than do passenger cars. This is particularly noticeable on grades. For example, the average passenger car can climb a long six or seven percent grade with little reduction in speed, but for the average heavy truck to negotiate a six percent grade at even 30 miles per hour, an engine developing in excess of 600 horsepower would be required. Although these high powered engines exist, they are not practical economically. By traveling at lower speeds on upgrades, trucks increase the number of passing maneuvers necessary for other vehicles to maintain reasonable speeds. Studies have determined that in mountainous terrain one dual-tired commercial vehicle has approximately the same effect on the roadway capacity as would eight passenger cars.

Traffic volumes and accident experience are the most important factors to be considered in designing climbing lanes. Most authorities agree that climbing lanes are warranted on two-lane highways carrying an average amount of truck traffic when the hourly volume exceeds 400 vehicles and the gradient is greater than five percent for a distance of one-quarter mile. Truck traffic is average when about 10 percent of the total daily volume consists of vehicles having dual rear tires.

Several years ago, the needs on U. S. Route 220 between Roanoke and Rocky Mount became critical. There was in place, over a section of rugged terrain known as Grassy Hill, an old 18-foot pavement with narrow shoulders. The grade and alignment were such that one or two northbound trucks could tie up passenger vehicles for several miles, and the accident rates were high since exasperated drivers often took daring chances, sometimes unsuccessful, at breaking the bottleneck.

Route 220 at the time was serving an average of over 3,000 vehicles per day, including some 550 dual-tired commercial vehicles. Because of the grade and percentage of commercial traffic, this old highway was carrying an equivalent of 5,500 passenger vehicles daily. While funds were not available for the reconstruction of a four-lane facility, it was obvious that some means

● **CLIMBING lane over Alleghany Mountains. Note sign on the right.**

● **THREE-lane section on US 250 over Afton Mountain. Picture shows the markings to permit up-hill passing.**

● **ADDITION of this third lane over Grassy Hill in Franklin County eliminated 95 percent of the congestion.**

SPEED UPHILL TRAFFIC

had to be found to permit reasonable operating speeds and eliminate congestion.

It was decided to add a 12-foot pavement lane to the worst portions of the existing road and to widen and apply additional superelevation to several curves. This stop-gap work on the 2½-mile section was started in July, 1952, and completed five months later at a cost of approximately $95,000. The $38,000 per mile cost was only a quarter of that estimated for complete reconstruction. According to latest reports, the local citizens and the operators of commercial vehicles are very pleased with the results of the stop-gap improvements.

The Highway Department has already planned a considerable section of four-lane relocation, which will eventually eliminate the long uphill pull over Grassy Hill. In the meantime, the interim work is providing much needed relief.

The climbing lane principle has been applied to several of our important three-lane roads. These highways, when marked to provide two lanes for upgrade traffic, are excellent examples of the greater facility and freedom of movement that can be provided by climbing lanes. U. S. Route 250 near Afton enables motorists to cross the Blue Ridge at the same operating speeds at which they would normally travel in rolling terrain, although this is the principal gasoline-hauling route between Richmond and the Shenandoah Valley. Thanks to a climbing lane, Route 11 between Shawsville and Christiansburg, ascending Alleghany Mountain, now serves over 6,000 vehicles per day, including a large percentage of heavy trucks, with a minimum of congestion.

Observations of traffic performance on climbing lanes in Virginia and other States have indicated the following advantages:

1. The construction of the extra lanes to accommodate slow-moving trucks results in a satisfactory movement of traffic, with greater roadway capacity and less delay.

2. The economic benefits—savings in time and operating costs—are considerable.

3. Accidents resulting from passing maneuvers influenced or caused by slow-moving vehicles have been practically eliminated.

4. The operators of the heavy vehicles as a rule welcome the additional lane as indicated by a lane usage of over 95 percent.

5. Climbing lanes aid in the performance of all maintenance operations and decrease the cost of snow removal.

While it is believed that the advantages from the truck lanes far outweigh the disadvantages, they are not foolproof. Occasionally the driver of one commercial vehicle will attempt to pass another heavy vehicle and in this instance the value of the facility is entirely lost. Extreme care must also be exercised in the signing and marking of the transitions at the ends of the climbing lane to insure safe merging movements. As on any other highway, normal enforcement is essential if passing violations of the barrier line on the single lane downgrade are to be curbed.

Regardless of their desirability, it is obvious that it is not economically feasible to place continuous truck lanes on all primary roads. Research projects have been completed, and more are now under way, which are intended to provide more information on traffic performance in heavy rolling and mountainous terrain. In this connection, the Institute of Traffic Engineers recently appointed a committee on Uphill Traffic Lanes to study this particular problem and to establish minimum warrants for this type construction.

From information already available, it appears that excellent results in relieving congestion, at even less costs, may be obtained by spacing relatively short climbing lanes, or passing bays, at predetermined intervals along long grades. However, there can be no set rules laid down for these facilities, and detailed field observation and capacity studies are necessary to plan such a project intelligently.

At a number of places in western Virginia, the cost of providing conventional four-lane facilities is all but prohibitive because of the terrain. For this reason, and since climbing lanes are daily demonstrating their value in improving traffic flow and safety, even more extensive use in the future seems certain.

Several miles of these facilities were completed during the past summer on U. S. Route 211, between Luray and New Market, in Page County. Plans are also being prepared to provide a similar treatment on State Route 100 over Little Walker Mountain in Giles County and on U. S. Route 220 south of Rocky Mount in Franklin County.

WATER ANALYSIS *is* BIG Business

WHEN a laboratory sets out to conduct more than 1,200 tests or analyses of all types of water per month, it is reaching into the realm of a "big-time" operation. That is the number of tests completed each month by skilled chemists and technicians at the new analytical laboratories of The Permutit Company at Birmingham, New Jersey.

To achieve this goal, a new two-story (one floor and mezzanine) structure was recently completed to house the modern analytical facilities and hydraulic laboratory. It was the fourth addition to the ever-expanding water testing program initiated by Permutit during the past few years.

This glass and brick structure, containing a total floor space of some 5,000 square feet, houses about 40 chemists, chemical engineers, technicians and office employees. There, in well-lighted rooms, these scientists and engineers are able to work with the most modern type of testing equipment such as spectrophotometers, colorimeters, flame photometers, etc., for the complete analysis of water samples from all

● **GENERAL** view of water analysis laboratory. Here water samples are received by a clerk who opens shipping cartons, removes sampling containers, enters data from accompanying tags on quintuplicate analysis forms and places samples on shelves in rear. From there they are removed in lots of twelve for various analytical tests.

● **OPERATING** a flame spectrophotometer. This instrument is used to determine the sodium and potassium content of the water sample being tested.

● **PERFORMING** tests for total hardness, calcium hardness, alkalinity and acidity. Total hardness is determined by titration with a standard sequestering solution using Erichrome Black T as the indicator. Calcium hardness is determined similarly using a calcium indicator. Bicarbonate and carbonate alkalinity are calculated from titrations with sulphuric acid using phenolphthalein and methyl orange indicators. Mineral acidity is titrated with standard caustic soda solution and methyl orange.

● **TURBIDITY** and sediment are determined by comparison of the shaken sample with similarly shaken turbidity standards. Shaking mixes sediment through sample.

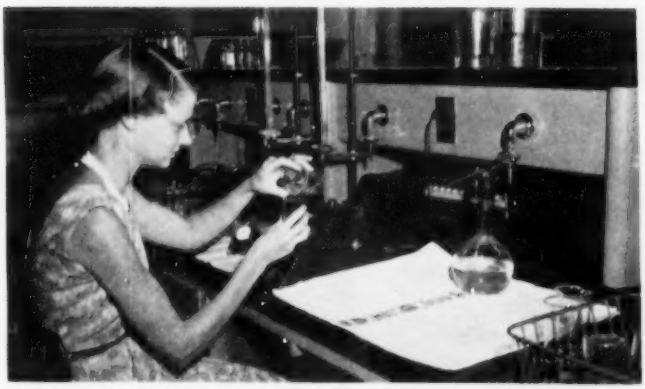
parts of the country. On file in this plant and in the New York office, are copies of hundreds of thousands of these tests completed during the past 42 years. Virtually every major source of water in this country and overseas has been tested at one time or another. The analysts also determine and study the behavior of cation and anion exchangers both in water treatment and other applications.

It is a general rule that all water samples received at the laboratories in the morning are analyzed and reported on that same day. Testing for an accurate analysis cannot be measured in minutes or hours as some are simple while others are complex in nature.

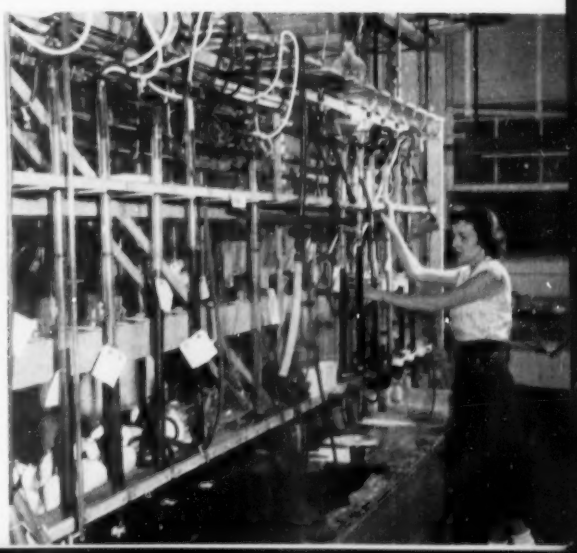
A typical analysis of a sample of water for household use includes tests for total hardness, sodium content, iron, turbidity, color, odor, dissolved electrolyte solids and pH values. For industrial waters, depending on the use this water is to

● **IRON** is determined by evaporating to dryness, heating to carbonize organic matter, dissolving in hydrochloric acid, oxidizing with potassium permanganate, treating with ammonium sulfocyanide and comparing the color with iron standards in Nessler tubes.

● **SULFATE** determination (below) is made by precipitation as barium sulfate under fixed conditions and measuring the turbidity so produced in the photoelectric colorimeter.



● **ION EXCHANGER** tube rack used in the Research Laboratory (right). This apparatus is used for testing exchange capacities of the cation and anion exchange materials which are investigated in the lab.



● **TITRATIONS, using caustic soda and silver nitrate solutions determine the free carbon dioxide and chlorine contents.**

● **ODOR sampling. Technician sniffs the sample, which she is shaking. This test relies on sense of smell and experience.**

be put to, tests are conducted for calcium, magnesium, sodium, hydrogen if acid, bicarbonate, carbonate, hydroxide, chloride, sulfate, nitrate, total hardness, alkalinity to methyl orange, alkalinity to phenolphthalein, free carbon dioxide, iron, total iron, iron dissolved, manganese, silica, organic matter, fluoride, turbidity, color, odor, electrolyte and pH values. Waters are also tested for manganese if it is suspected.

Membrane Development

In addition to the performance of this variety of water analyses, intensive study of the phenomenon of electrodialysis utilizing ion exchange membranes is being conducted in the Permutit laboratories.

These membranes or membrane processes depend on the same chemical structure as the conventional resin beads, except that they are formed in a continuous sheet. In electrodialysis, however, only the ability of the cation or anion to move through the membrane functions. For example, if a cation exchange membrane separates into two chambers, a vessel containing salt water, the sodium ions move freely through the membrane in both directions; but the chloride ions cannot pass through the cation membrane and remain in the original chamber. If a small electric field is applied the sodium ions will move through the membrane only in the direction of the negative electrode. At the end of the process all of the sodium is found on one side of the partition, and the equivalent hydrochloric acid on the other side. By suitably constructing a multi-chambered cell partitioned with

● **CONDUCTING tests on ion exchanger membranes developed in the Research Laboratory. A small amount of electric current controls the direction of passage of ions through the membrane. This principle may be applied to salty water treatment.**

cation and anion membranes, a stream of seawater can be continuously divided into a pure water stream and a highly concentrated brine, at the expense of a small amount of electricity.

As an example of the economics involved, desalting brackish water of 5,000 ppm electrolytes down to 500 ppm by conventional ion exchange would cost $1.32 per 1,000 gallons. Treating the same water by a membrane cell would cost only $0.15 per 1,000 gallons.

Electrodialysis with ion exchange membranes offers promise in fields other than water purification. Chlorine-caustic manufacture; the concentration of spent dilute pickling acids, waste salts and alkalies; protein demineralization; and the separation of certain ions all appear to be practical applications. In the electro-chemical industry, energy losses due to the mixing of anolyte and catholyte can be minimized by the use of ion exchange membranes as partitions. It is anticipated that the increased knowledge being obtained in this field and the improved membranes being developed will soon expand the fields of ion exchange application by facilitating working up regenerant solutions.

● **COLOR tests rely on comparison of sample with color samples. Nessler tubes are used in this determination.**

Economy

IN PARKING LOT STRIPING

GORDON W. DABNEY,
Highway Engineer,
Headquarters, Fourth Army

IN order to utilize parking areas to the fullest extent, marking of spaces is necessary. Painted stripes have been used throughout the Fourth Army area, but keeping them legible requires frequent repainting. The high maintenance and first costs of painted stripes have led to a search for a more economical satisfactory marking. Cost figures of the Texas Highway Department show that for center lining highways, the first cost of the asphalt stripe is approximately one-half that of the painted stripe. Although the raised asphalt and aggregate type line was found satisfactory for marking parking lots, the striping machines in use were too cumbersome for marking small areas.

The first raised asphalt stripes used at Army installations in the Fourth Army area were placed at Fort Sam Houston, Texas, using paper stencils and hand spray methods and placing the aggregate by hand. The labor cost was excessive, and it was realized that a more economical method of application would be necessary.

Fort Sam Houston Post Engineer personnel devised a machine for marking parking areas with asphalt. Asphalt is supplied by the distributor pump through a connection to the hand hose, and the aggregate hopper is kept filled by hand. In starting the spray on cool days, it is usually necessary to let the nozzle run for a while to insure proper functioning. If the speed of the pump remains constant, the operator soon learns the speed to push the machine to secure the correct rate of asphalt application. The rate of aggregate application is regulated by varying the opening on the gate of the hopper. As the machine is pushed forward, it applies asphalt in a strip of the desired width as set on the machine, covers the strip with aggregate, and rolls the completed stripe with the rear wheels. Additional rolling using truck wheels is desirable but rolling with a flat wheel road roller is often unsatisfactory as it tends to crush the aggregate. If an asphalt distributor is not available, a small asphalt pump may be substituted using an SS-1 emulsion. However, when emulsions are used traffic must be kept off the stripes until the emulsion has completely broken.

The asphalt stripe is similar to a seal coat of 4-in. width, and asphalt and aggregate should be applied at the same rates as for a regular seal coat. The rates for striping will vary with the type aggregate, type of asphalt, and pavement condition. Using RC-2 cut-back or RS-2 emulsion and ½-in. to #4 aggregate, one gallon of asphalt will cover from 80 to 120 linear feet of 4-in. stripe; and one cubic foot of aggregate will cover 75 to 95 linear feet of stripe.

Clean, hard aggregate, uniform in size, should be used. Either of the following gradations is satisfactory: (1) 100% passing the ½-in. sieve and 0-2% passing the #4; or (2) 100% passing the ⅜-in., 0-15% passing the #4, and 0-2% passing the #10 sieves. The aggregate selected should also give a contrasting line after the pavement and line have been subjected to extensive use. Some lines will change color when exposed to the elements or become dingy with use, especially those containing limestone which is very white when first crushed. Also, asphaltic pavements made from white aggregate may revert to a light gray color, therefore consideration should be given to the anticipated color of both the pavement and the line during the expected life of the line. White lines made from hard white crystalline aggregate and black lines made from black trap rock have been most satisfactory. Black aggregate stripes usually give the best contrast in color on both asphalt and concrete pavements. Stripes using gravel as the cover aggregate are still in use at Fort Sam Houston, Texas, after three years' service but have become dim; whereas those placed using black trap rock are still very distinct.

In addition to the reduced maintenance cost resulting from the much longer life of the asphalt stripes, the first cost of parking lot lines made by the small shop-made asphalt striping machine is approximately half that of paint stripes placed by use of the smaller type line painting machines. For jobs of any size where close maneuvering is required, large savings can be effected by duplicating the Fort Sam Houston method.

● **THIS is the machine used for placing asphalt aggregate stripe.**

Design and PERFORMANCE of an Award Winning SEWAGE TREATMENT PLANT

● AERIAL view of Orlando's sewage treatment plant. Operating data are presented in this article.

J. V. SWIFT

Sanitary Sales Engineer,

The Dorr Co., Atlanta, Ga.

ORLANDO'S sewage treatment plant is of the two stage series-parallel Biofiltration type with Jenks and Ward split recirculation. The plant was designed by Smith & Gillespie, consulting engineers of Jacksonville, Fla., and was constructed by the Ivy H. Smith Co., also of Jacksonville. The bid price was $972,848, or about $12 per capita based on a population of 80,000. Design is based on an average flow of 8.0 mgd and a maximum flow of 16 mgd.

The sewage enters the booster station through 20-in. cast iron pressure mains, and from there is pumped through 11,000 feet of 30-in. cast iron pipe to the raw sewage diversion box at the plant. There are 3 pumps, two at 4000 gpm and one at 2000 gpm.

The diversion structure provides sluice gate control of the sewage to the primary clarifiers, thus permitting the operation of either or both halves of the treatment process which is constructed in parallel. The diversion box is also the point of return of the recirculated sewage from the primary filters and it receives the humus sludge from the secondary clarifiers and the supernatant liquor from the digesters. Although flow proportioned pre-chlorination of the raw sewage is provided at this point, operating experience thus far has not shown it to be needed for plant odor control.

The mixtures of raw sewage, recirculated primary filter effluent, humus sludge from the secondary clarifiers and supernatant liquor return are clarified in two 120-ft. diameter Dorr primary sewage clarifiers, each equipped with positive mechanical skimmers. Based on a design flow of 8.0 mgd plus the recirculated flow of 10.0 mgd (1.25Q), the two primary clarifiers provide a detention time of 2.5 hours and an overflow rate of 800 gallons per square foot per day.

Table 1—Actual vs. Computed Efficiency of BOD Removal From Settled Raw Sewage

	Percentage BOD Reduction	
Month	*Theoretical*	*Actual*
January	95.3%	90.4%
February	94.7	92.4
March	94.9	93.9
April	94.3	93.9
May	94.5	94.5
June	94.4	94.1
July	94.2	95.8
August	90.7	93.7
September	87.2	91.0
October	88.4	89.7
November	91.8	92.6
December	91.2	90.6
Average	92.4	92.7

As stated above, the sludge from the secondary clarifiers is returned to the raw sewage diversion box, thus all sludge is pumped from the primary clarifiers to the digesters.

A very high average percentage reduction of the raw sewage BOD and SS is consistently achieved in the primary clarifiers. The removal of BOD in the primary clarifiers averaged 76 percent for the year, and of SS 70.1 percent.

These unusually high removals can be attributed to several factors: The high settling rate of suspended solids is produced by the effect of the humus recirculated from the primary filters and the secondary clarifiers which causes a "carry down" or accelerated settling rate. The high BOD reduction can be attributed in part to the increased solids removal. Both BOD and solids reduction by dilution is produced from the large volume of recirculation of the partially stabilized and oxidized primary filter effluent.

The settled sewage effluent from each of the primary clarifiers enters into its respective control box, which consists of two compartments created by a dividing wall placed diagonally from opposite corners within the rectangular structure. The division wall is equipped with a weir on top and a sluice gate

through, thus providing for the correct range of sewage flow to the primary filters. The excess flow received from the primary clarifiers overflows the weir into the other compartment and is applied to the secondary filter; also the recirculated volume is also returned to this compartment from the secondary clarifier. Sluice gate valves are provided at the control box on the 30-in. lines to the primary filter and the 36-in. lines to the secondary filter so that either may be shut down and the other operated.

The two primary and the two secondary filters are the same size, each being 120 ft. in diameter and 5 ft. deep, with media of 1½ to 4-in. slag. The primary filters are equipped with Dorrco distributors, each consisting of two fabricated single compartment tapered arms capable of handling a flow range of 2800 to 4000 gpm. The secondary filters are also equipped with Dorrco distributors, these consisting of four fabricated double compartment tapered arms to handle a flow range of 3200 to 8400 gpm. The wide flow ratio of the secondary distribution is to permit the more constant and uniform application of the stronger sewage to the primary filters, with the volume variations or flow peaks to the filters being absorbed mainly by the secondary filters.

The operating results produced by the filters to date have been excellent, with no ponding encountered and practically total absence of Psychoda.

Recirculation

Continuous application of sewage is assured to both the primary and secondary filters for constant distributor operation regardless of sewage flow entering the plant. A primary recirculation pump station is located at the low gradient end of the main center drains at each of the two primary filters. This is equipped with one Fairbanks-Morse propeller type pump rated at 3500 gpm, which as previously stated, discharges into the raw sewage diversion box, thus completing the recirculation cycle.

Adjacent to each of the two secondary clarifiers is a secondary recirculation pumping station, with the recirculated volume taken from recirculation launders which surround the influent well of the secondary clarifiers. Each of these two pump stations is equipped with a Fairbanks-Morse propeller type pump rated at 2800 gpm. This discharge is recirculated to the secondary compartment of the filter control boxes, completing the final phase of the circulation control cycle. A total of 5600 gpm through both pumps, or 8.0 mgd provides a 1:1 recirculation ratio in the second stage.

The two secondary clarifiers, Dorr equipped, are also 120 ft. in diameter. Based on design flow plus recirculation the units provide a detention time of 2.3 hours and an overflow rate of 710 gallons per square foot per day. The units are operated continuously and the humus sludge return is constant, with the rate of return controlled by telescoping valves located in the wet well of the power house. Both the humus sludge from the secondary clarifiers and the supernatant liquor from the digesters are returned to the raw sewage diversion box by two automatically controlled 350 gpm secondary sludge pumps.

Table II—Performance of Two-Stage Plant Using Series-Parallel Flowsheet (Fig. 1)

Flow—MGD	5.45
Recirculation Ratio	
Primary R_1	0.835
Secondary R_2	1.46
Clarifier Overflow Rate	
Primary	684
Secondary	595
Filters	
Total area—Acre	1.04
Depth Feet	5.0
Volume Acre-Ft.	5.20
Dosing Rate—MGAD	
Primary Filter	19.30
Secondary Filter	25.90
BOD Raw Sewage	102.40
Est. Removal by Settling—%	30.0
BOD of Settled Raw Sewage	
ppm	71.6
Lb. per day	3260
Lb. per Acre-Ft.	628
BOD of Final Effluent	
ppm	7.3
Lb. per day	332
Lb. per Acre-Ft.	64
BOD Removed from Settled Raw	
ppm	64.3
Lb. per Acre-Ft.	562
Efficiency	
Based on Settled Raw—%	89.9
Based on Raw Sewage—%	92.7
Computed Efficiency	
Based on Settled Raw—%	92.4
Based on Raw Sewage—%	94.7

The effluent lines from the two final clarifiers converge and the treated flow is measured through a 24-in. Parshall Flume, receives final chlorination from a Wallace & Tiernan automatic chlorinator, and then passes through 19,000 feet of 42-in. concrete gravity outfall line to a tributary of the St. Johns River.

The settled sludge from the primary clarifiers is pumped to two 75-ft. diameter, 25-ft. deep digesters.

From the date the plant was put into operation in June, 1950, to midsummer 1954, approximately 8,150. million gallons of sewage have been treated. Records show that maintenance and operating materials cost for the clarifiers and distributors total $1,054.95 for this period, as follows: Replacement and spare parts $91.15; paint $588.96; and lubricant $374.84.

Theoretical vs. Actual Performance

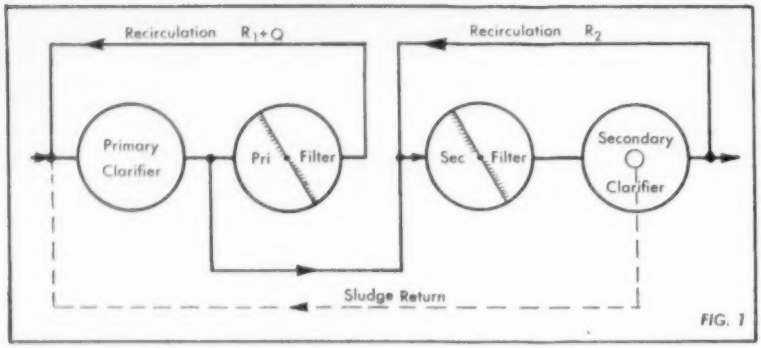
The flowsheet used at the Orlando, treatment plant is an application of the simpler Intermediate Plant flowsheet which has been expanded by the addition of a second stage, resulting in the two-stage series-parallel flowsheet (Fig. 1). The Intermediate Type Plant consists of a clarifier and filter in series, the filter effluent returned to the clarifier influent and the plant effluent withdrawn from the clarifier effluent; however, when used as shown in flowsheets (Figs. 1 and similar), the plant effluent becomes the feed to the second stage.

In the intermediate design, settled effluent from the clarifier must be passed once through the filter before recirculation can be established; hence the flow to the filter equals Q+RQ where Q is the average raw sewage flow and R is the recirculation ratio. The clarifier must be capable of handling the filter effluent in addition to the raw sewage flow. The total flow into the clarifier equals Q(R + 2).

The percentage of settled raw BOD remaining in the effluent of a plant using the intermediate flowsheet can be computed by assuming repeated passage through the filter of weighted volumes of settled raw sewage and settled filter effluent. The equation for determining the above is as follows, where PR is the percentage of BOD remaining:

$$PR = 100\ [1.5 \div (R + 2.5)] \quad (1)$$

The two-stage series parallel filter flowsheet (Fig. 1) has some unusual characteristics. A portion of settled raw sewage is constantly passing to



● **FLOWSHEET for two-stage series parallel operation of filters.**

the second stage filter, thus assuring a more even distribution of the initial food supply between the two stages. This should permit the second stage to function with the same efficiency as the first stage because the "treatability" of the sewage should be the same for both filters. In a gravity flow plant using this flowsheet, the two stages of filters can be placed at approximately the same elevation, with pumping requirements equal to $Q(R_1 + 1)$ in the first stage and QR_2 in the second stage, Q being the average raw sewage flow and R_1 and R_2 being the recirculation ratios in the first and second stages respectively.

The evaluation of performance of plants using this flowsheet can be computed by applying the performance of a single stage filter to the effluent from an Intermediate type plant, using the Tentative Standards method. Where e = BOD of settled effluent in ppm; c = BOD of settled raw sewage as a result of using Equation 1; and R = Ratio of recirculated flow to raw sewage flow in the second stage;

$$e = c \div (2R + 3) \qquad (2)$$

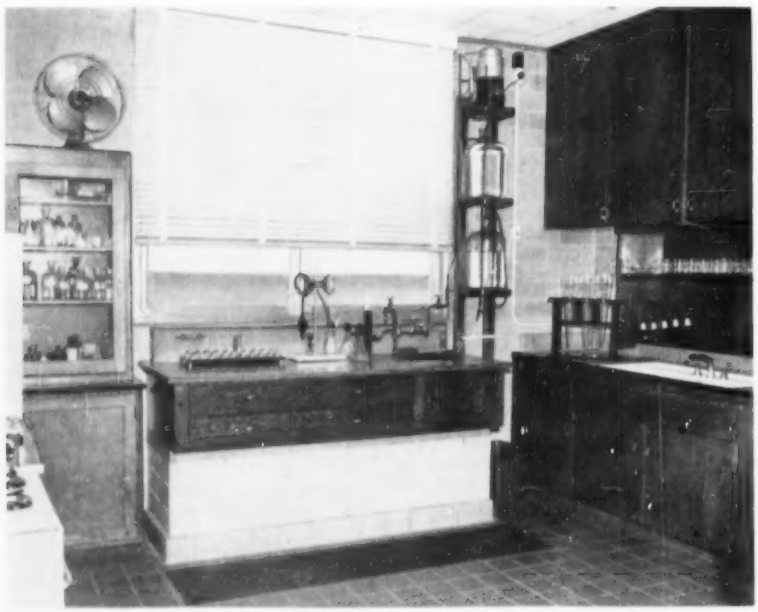
By combining Equation 1 and Equation 2, a still simpler equation can be used to achieve the same results. The percentage of settled raw BOD remaining in the effluent of a two stage series-parallel plant (Fig. 1) can be determined by Equation 3, where R_1 = Recirculation ratio in the first stage; and R_2 = Ratio of recirculated flow to raw sewage flow in the second stage.

$$PR = 100\,[0.75 \div (R_1 + 2.5)\ (R_2 + 1.5)\,] \qquad (3)$$

In addition to being the largest Biofiltration type plant in Florida, the Orlando plant is also the most outstanding, both in appearance and operational efficiency. It has been visited by engineers from all over the United States and from a number of foreign countries, as well as by many tourists.

The Florida State Board of Health awarded to this plant in 1953 the Florida State Board of Health Merit Certificate for the best operated trickling filter plant. Again in 1954 the Florida State Board of Health awarded to the City of Orlando the Annual Sewage Plant Merit Certificate for the best operated sewage treatment plant of any class.

For data generously contributed, acknowledgment is particularly due R. E. Simon, Superintendent, Sewage Treatment Plant, Orlando, Florida; Smith & Gillespie, Consulting Engineers, Jacksonville, Florida; Mason S. Nagel, Orlando, Florida; and R. S. Rankin, Manager, Sanitary Engineering Division, The Dorr Company, Stamford, Connecticut.



● **INTERIOR view of the Orlando plant showing the well-equipped laboratory which permits evaluation of operating results and control of plant operations.**

• • •

Package Plants for Garbage Composting

Experimental work has been under way for some time at the University of Michigan on garbage composting. Now it is reported that these have progressed to such a point that within a year it will be possible to have plans and specifications for plants which will "transform five to seven tons of garbage a day in a quiet and odorless manner into useful organic fertilizer."

• • •

A Sewer Tunnel 692 Feet Long

Glendale, Calif., part of the Los Angeles metropolitan area, is constructing a $1,350,000 storm drain system. At present runoff from even light showers has turned downtown streets into small rivers. An unusual feature of this system is a 12-ft. tunnel 692 ft. long which forms the main trunk. It passes beneath the station yard and main line of the Southern Pacific RR, 38 ft. below the surface, through sand, which necessitates complete support by Armco liner plates at all times. Construction has advanced at an average rate of 20 ft. per day.

SHOULD WE WRITE *Finis* To our FAILED SEWERS ?

R. L. MUELLER,

Engineer,

Armco Drainage & Metal Products, Inc.

One of the serious problems confronting our cities today is the deterioration and failure of sewers. Many of these sewers were built 50 or more years ago and have arrived at or served beyond their expected life. The question is, what can be done about them short of complete and costly replacement?

PUBLIC WORKS, in its issue of January, 1937, discussed the idea of relining old sewers with corrugated metal pipe. Other contemporary publications have done likewise since that article appeared. To learn how well a number of representative relined sewers were serving, an extensive series of inspections was carried out in the State of Wisconsin, during the summer of 1953. This was done by the author and various city officials.

Among the sewers inspected was one at LaCrosse. Here a 50-year old brick, egg-shaped trunk sewer had been relined from 1939 to 1941 with corrugated metal pipe. Some 3300 feet of sewer was reworked. Inspection revealed that after 14 years both structural and material condition were excellent.

Another noteworthy case is that of a corrugated metal "cunette" installed at Sheboygan. This is a 24-inch wide half-round Asbestos-Bonded paved and coated liner installed in 1939 in the invert of a concrete box that had been badly eroded. After 14 years of service the bonded metal cunette appears to be in its originally installed condition.

All in all some 16 different installations in eight cities were inspected. Besides LaCrosse and Sheboygan, these included Kenosha, Racine, Port Washington, Marinette, Manitowoc and Milwaukee. Sewers ranged in size from 24-inch to 72-inch diameter. Results of these inspections demonstrated that if there had been any question about effectiveness of this method of sewer reconstruction, it had been well answered. All the sewers were doing their work well.

Techniques in Relining

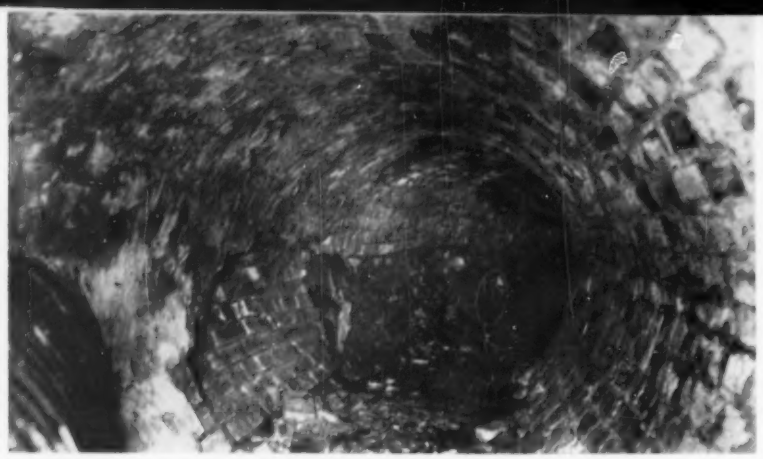
Techniques of relining these old sewers have varied widely. As a result of the Wisconsin studies general recommendations on good procedures can be outlined.

There are two ways of starting such a job. The material may be lowered into the sewer through manholes or threaded in from either end. Where it is possible to work from an open end, corrugated metal pipe fabricated to a shape similar to that of the original sewer can be threaded into the line on skids or rollers.

If the material must be lowered through manholes, the maximum length of the reliner section depends on the size of material that will go through the manhole and can then be conveniently assembled within the sewer. There are cases where an old sewer has collapsed completely. Conditions such as these must be corrected by tunneling. Liner plates are commonly used as a construction material in these sections. Corrugated metal sewer pipe can then be threaded through the liner plate.

Design of a sewer reliner does not involve the indeterminate factors that must be considered in the design of a new sewer. The condition that caused the failure of the original material gives a positive indication of what the relining must

● EGG-shaped brick sewer 50 years old was relined in 1939 with Armco pipe.



● **BRICK sewer in Sheboygan, Wisc., after perhaps half a century of service, is scheduled for relining with corrugated metal pipe to provide longer life.**

be designed to withstand. Old sewers usually fail because of erosion and/or corrosion in the invert, or structural failure of the pipe under load.

In the former case the corrugated metal reliner is supplied with special protection in the invert. This is generally Asbestos-Bonded metal with the corrugations in the lower third of the pipe filled with asphalt.

Where structural failure has occurred, corrugated metal is a logical choice because of its great strength. Flow records will determine how much reduction in area can be allowed, while the amount of deflection or deformation of the old sewer will determine the maximum diameter of the relined pipe. Very little loss in diameter is necessary when using corrugated metal as the corrugations are only ½-inch deep. This means that only one inch plus a small grout space need be taken from the diameter of the original sewer.

It is recommended that all voids between the reliner and the old structure be filled with a concrete grout mixture, care being taken that no water is trapped in the annular space. A good procedure is pressure grouting from one end of the reliner. As grouting and assembly progresses, this forces out all excess water. An alternate method would be to pump grout under pressure through grout plugs from within the reliner.

Where it is not possible to install pipe that has been completely shop assembled, it is customary to supply the pipe in separate top and bottom sections. A number of simple methods of assembly have been perfected for these installations.

Connecting lengths of full round pipe is best done with external contracting bands. When these are drawn up, self-tapping screws are inserted to fasten permanently the continuous sewer pipe. This eliminates entirely any protrusion within the sewer.

The life of most existing sewers can be effectively lengthened to as much as double their normal life through the technique of relining with corrugated metal sewer pipe.

● **CUNETTE of asbestos bonded half-round pipe was installed 15 years ago in this concrete box sewer in Sheboygan, insuring many more years of useful life.**

Bending Saves Money On Pipes and Conduits

FITTINGS were largely eliminated in the installation of conduits at the Terminal Building and the Warehouse of the Wisconsin Air National Guard General Mitchell Field, Milwaukee. In the warehouse work, E. D. Wesley Co., plumbing and heating contractors, reported that 43 fittings, in sizes ¾-inch to 6-inch, were eliminated resulting in a saving of $131.40 in material and 16½ hours in time. Total bending time required was 422 minutes, whereas on the basis of other work it was estimated that 1430 minutes would have been required for fittings, including cutting and threading or welding.

The Magaw Electric Company reported that, on the Air Terminal Building, 253 bends, 1-inch to 3½-inch, were made and only 11 elbows were used. The savings from the employment of the bender was 121 hours and 8 minutes in time and $343.77 in material. On a previous larger job, this company used only 3 elbows and made 621 bends of 90° in 1-inch to 3-inch conduit, with very substantial savings.

The savings accrue from the reduction in the number of pieces of material to be handled and also in the conduit which has to be scrapped when cut. Thus, the Magaw Co. estimates that 2 men require an hour and 40 minutes to install a 3-inch conduit line with a 90° elbow, but only one man 60 minutes with the type of pipe bender used. The material and time saved amounts to $7.91.

The conduit benders used on this job were the so-called "one-shot" benders, with long rams, half circle shoes and bend indicators. With this equipment, which is made by Tal Bender, Inc., Milwaukee, any degree of bend can be made in one operation without moving the pipe; and more than one bend can be made in a single pipe length. For instance, the Wesley Co. had one length of pipe with three 90° bends in it; this was installed without difficulty. Offsets are also possible. Again, the Wesley Co. cites a piece of pipe having a 90° bend and an offset. By using the bender, one piece of pipe was used and three bending operations were necessary. With fittings, a 90° bend and an offset would have been required, with three cuts, six threads or welds and three fittings, with seven pieces of material to be handled and assembled.

WISE PLANNING *Cuts Costs* of WATER WORKS ADDITION

E. J. KNUDSEN

AN excellent example of foresight on the part of public officials that has resulted in municipal operating economies can be cited in the new additions to the water system of Arlington Heights, Ill. The additions include the erection of a new one million gallon steel reservoir, a new pumphouse and additional feeder lines.

The first step in the succession of economy moves was the purchase of a 5-acre site a quarter of a mile from the center of town. Of this, 1½ acres were used for the reservoir and pumphouse. At the purchase price of $5,000, this site was considered a bargain by real estate authorities.

Secondly, by ordering this second one-million gallon reservoir, recently erected, along with the one constructed last year, a saving of $5,000 in the purchase price was realized.

Thirdly, by constructing its own foundation ring-wall for the new reservoir, the town saved 50 percent in construction costs plus the expenditure necessary for letting bids.

Fourthly, the added water facilities saved the community from an increase in fire rates since the town would certainly have been retrograded from its present 5th class to 6th class in its fire risk classification had not the new facilities been installed.

The reservoirs were erected by Chicago Bridge and Iron Co.; consulting engineers for the job were Consoer, Townsend and Associates; and the cost of the added facilities was $250,000. The engineers are now making a survey and report on water softening, feeder mains and other water supply additions for the town.

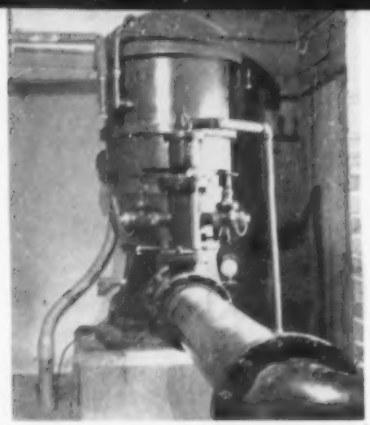
While not unique in this respect for suburban towns, Arlington Heights has experienced a phenomenal growth in the past few years. The population has sky-rocketed from 8,768 in 1950 to the present 13,380. The current program of 2,000 homes under construction indicates further advances in population figures and their attendant demands on water. Consequently, the expansion of water facilities was well-timed.

● **PUMP HOUSE, with reservoir at left, is located on a convenient 5-acre site.**

The reservoirs are 73 ft. in diameter and 32 ft. high to the over-flow line. To obtain the water, a well was drilled 1550 ft. through the Galesville sandstone. A Layne turbine pump, powered by a Westinghouse motor, pumps water from the well into the reservoir at a rate of 1250 gpm. In normal times, the pump operates from 5 to 6 hours per day. Two American Well Works pumps —one with a 1050-gpm capacity and the second with a 1400-gpm capacity —pump water into the feeder lines. A third pump, driven by a Continental gas engine, was installed in the pumphouse as a standby for possible interruptions in electric power.

Supplementing the main water supply are three other wells situated at various places around the town, which are used intermittently and at peak-use periods. Water is drawn from these wells by pumps with capacities ranging from 450 to 620 gpm. To maintain adequate pressure at times of excessive water usage in the system, an elevated tank with a 250,000-gal. capacity is located at one of the wells. A 24-hour check for low pressures is assured by the placement of a master chart in the town's police station. As an indication of Arlington Heights' providence against all possibilities of fire, the new housing projects are provided with water lines even while under construction. An example is a 650-home project now under way which was provided with Ludlow hydrants spaced every 400 ft.

The Arlington Heights Water Department is on a complete self-sustaining basis under a meter system, with a total of 4,000 meters installed. Rates start at 45 cts. for the first 10,000 gals. and are lowered 5 cts. for each 10,000 gals. thereafter un-



● LAYNE turbine pump has capacity of 1250 gallons per minute.

til a rate of 30 cts. is reached. Added revenue for the department is currently being realized by charging 65 cts. per 10,000 gals. to supply water over a 2-in. line to a housing project outside the town's limits. Although this is on a temporary basis, the project's contemplated new wells could be a valuable standby for Arlington Heights in an emergency.

Operating economies in the department are effected by using its crews in other city departments when they are finished with their duties in the water department. A total of 10 men, with an approximate payroll of $3,[illegible]00 monthly, are assigned to the water department. Included is the pump operator who attends each pumphouse twice a day, doing the maintenance work; one meter reader who devotes 12 days a month to reading meters; and the remaining eight men who divide their time on water department work, street maintenance, lighting and sewer work.

The Arlington Heights Water Department is under the supervision of Wm. W. Luehring, Superintendent of Public Works.

PLANT FUEL COSTS DROP 35 PERCENT SINCE INSTALLING NEW ENGINE

BY installing a new 1,000-hp. Fairbanks-Morse dual-fuel engine and switching the bulk of its operations over to natural gas, the municipal power plant at Forest City, Iowa, has cut fuel costs more than 35 percent since mid 1950 and reduced total plant production expenses more than 27 percent. As a result of these savings, the plant has been able to pay off a revenue bond issue of $150,000 in just 3½ years.

The bond issue was used to finance an improvement and expansion program completed in June, 1950, with the addition of the Fairbanks-Morse engine and the construction of a new wing on the power house building. This raised the number of prime movers in operation to five, increased the plant's generating capacity to 1,865 kw. and re-established a firm capacity in excess of peak load.

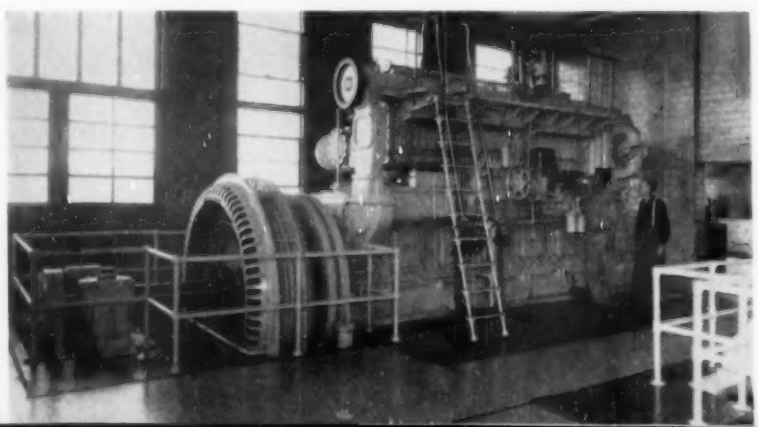
Since going into service more than three years ago, the Fairbanks-Morse diesel has been the most economical engine in the Forest City plant. In the 20-month period between June, 1950, and October, 1953, it was in operation for a total of 14,350 hours, generating 7,336,260 kw. hr. at an average fuel cost of 3.89 mills per kw. hr. (just half the plant's previous cost), based on a prevailing gas price of 26 cents per thousand cubic feet and an oil price of 11 cents per gallon. At the same time the plant's second gas-burning engine, a Busch-Sulzer diesel converted to dual-fuel in May, 1951, delivered power at the rate of 5.62 mills per kw. hr., or 25.6 percent below the 7.77 mills per kw. hr. reported for fiscal 1949-1950, the last complete 12-month period before the F-M engine was installed.

Meanwhile, total plant production costs (before interest and depreciation) dropped from 13.7 mills per kw. hr. in 1949-1950 to 9.8 mills during the first 10 months of 1953. This was achieved in the face of rising wages, fuel prices and other expenses and is directly attributable to the low cost of dual-fuel operation.

The Forest City electric system has been consistently profitable and fuel savings since installation of the F-M unit have more than balanced other rising costs. From April 1, 1950, through October 31, 1953, the department earned a net profit (before depreciation) of $159,383.04. Deducting the allowance for depreciation, clear net profit was an impressive $112,712.29. In the first 10 months of 1953, profits before interest and depreciation had already reached $44,263.71.

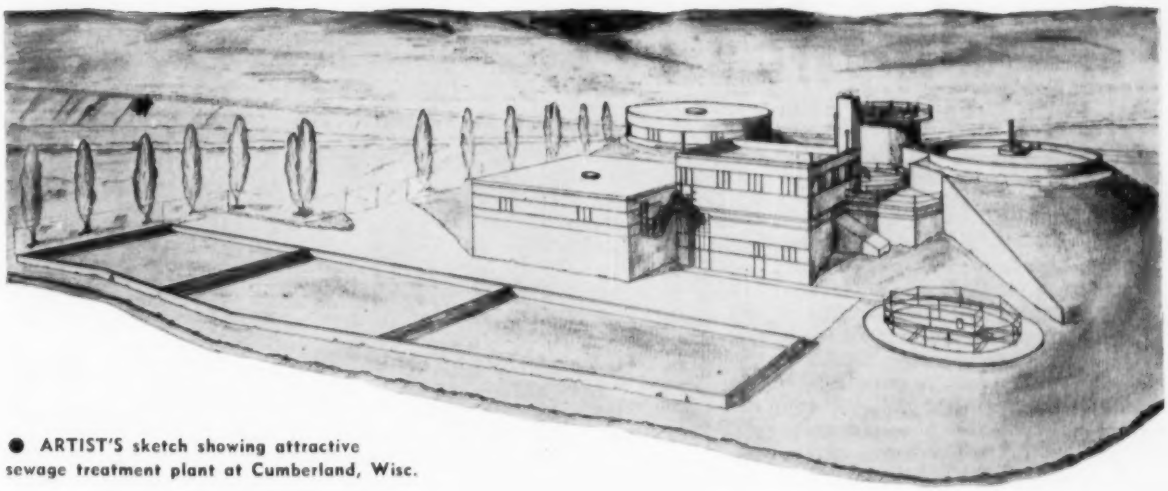
The Forest City municipal power plant is a typically prosperous public utility, returning handsome dividends to the city treasury in the form of continuously increasing profits and providing its citizen-owners with dependable, low-cost electric energy. Thanks to the efficiency of the plant, electric rates have never risen above their pre-war level, despite increases in fuel prices, wages and other operating expenses.

Ultimate responsibility for the success of the plant rests with Roy Shram, Mayor, and with the following members of the Town Council: Earl Anderson, Edward Christ, H. E. Cribbs, W. B. Hibbs, Merle Hill and Carl Sunde. Immediate responsibility for the plant's operating efficiency and economy rests with Howard Nessa, Superintendent of Light and Power.



● SUP'T. Howard Nessa and the new 1000-hp. F-M dual-fuel engine.

THEORY OF COMPACT WASTE TREATMENT PLANT DESIGN



● ARTIST'S sketch showing attractive sewage treatment plant at Cumberland, Wisc.

R. L. SMITH and C. D. PIHLSTROM,

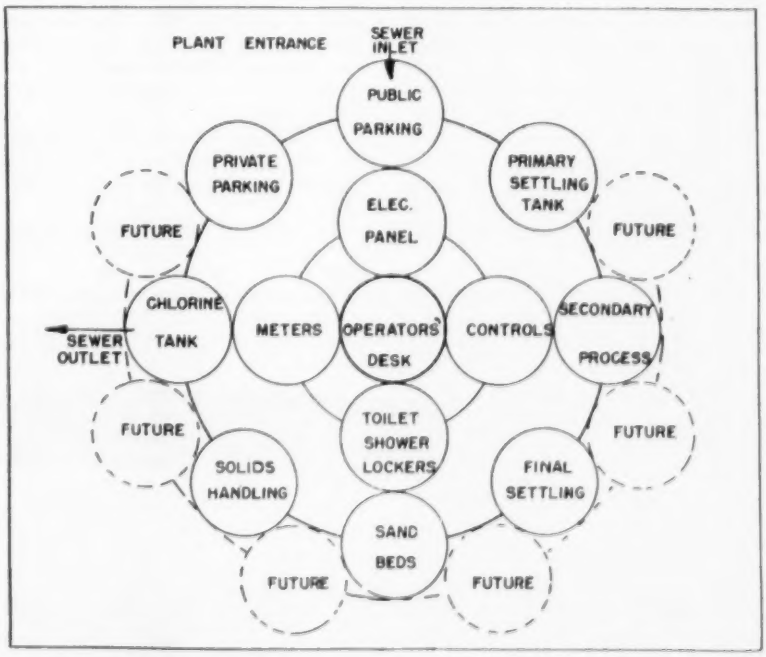
Consulting Sanitary Engineers

MOST waste treatment plants are designed on the basis of a number of disconnected units, the units being placed well apart and connected only by pipe or electrical service. This method has certain advantages over a more compact design. First, the footing conditions are simple and inexpensive; and second, the design is of a unit independent of any other unit except for the general form of architecture. The second consideration makes for a much simpler design problem and the tendency of the designer is to make each unit and each plant a duplication of similar previous constructions with very minor alterations. Our universities tend to teach the design of a treatment plant unit by unit rather than as an integrated whole.

The compact type of design makes a major increase in the cost of footings for the units that directly abut the central structure or Control House. It is inevitable, assuming that the sewage must be pumped, that the Control House should be the deepest structure and the buildings radiating around such a structure must require extra footings. It has been the experience of the writers that the reduction in the pipe lengths and the improvement in the controls make the compact plant equal or slightly lower in cost than the scattered type plant.

The theory of the compact type plant meets a conception of concentric circles, the operator being at the center of all units with the more commonly used units readily available and the less commonly used

(*Continued on page* 126)



● THEORETICAL layout for compact waste treatment plant, with extensions.

TURNPIKE TRAFFIC CONTROL

JOHN R. CROSBY

Assistant Traffic Engineer

N. J. Turnpike Authority

THE completion and opening of the first section of the New Jersey Turnpike in November 1951 and the full opening of the 118 miles of modern limited access divided highway on January 15, 1952, signaled the beginning of the traffic control and operations phase on the Turnpike. It is the purpose of this article briefly to cover the scope of the problems involved and to note some of the steps in operational procedures that have been taken the better to serve and safeguard traffic.

The New Jersey Turnpike ended the calendar year 1953 after handling more than 41,000,000 vehicles during the 26 months since the opening of the first section to traffic in November 1951. During 1953, a total of more than 22,000,000 vehicles entered through the 17 Interchanges with local New Jersey highways to roll up the astounding total of 870,000,000 vehicle miles of travel over the 118-mile modern controlled access highway. If current estimates of nationwide travel may be assumed to be correct, vehicle mileage on the Turnpike constitutes 1/640 of the national total. This statistic may appear insignificant until one considers that the country as a whole has approximately 3,300,000 miles of streets and highways to be weighed against 118 miles of Turnpike.

New Jersey has long been considered a traffic corridor between the great metropolitan areas of New York and Philadelphia and the States to the southwest and northeast. There would appear to be a good deal of logic to the conclusion that most of our traffic is of the long distance type. However, this is not the case. Full length trips between the George Washington Bridge and the Delaware Memorial Bridge Interchanges account for less than 6 percent of all trips on the Turnpike. Even when the trips from all Interchanges serving the New York and Philadelphia-Pennsylvania areas are included, these aggregate slightly less than 20 percent of the total trips. License plate checks made at various points along the roadway indicate that about 65 percent of the vehicles using it are out-of-state. This would seem to indicate that the Turnpike serves out-of-state travelers who have destinations within the state of New Jersey.

The Turnpike acts as a link in the State highway network serving equally well the needs of the local motorist and interstate traffic movement. In the years to follow, it will tend to play an even more important role in the local movement of traffic.

The passenger vehicle is the biggest user of the Turnpike, with 88.5 percent of the vehicles and 89 percent of the total mileage. Trucks accounted for more than 9.5 percent and buses for 1.9 percent of the total vehicular traffic. Truck traffic has shown an increase of nearly 24 percent over the former year, but the percentage of trucks is less than that found on routes paralleling the Turnpike.

Seasonal traffic patterns on the Turnpike closely follow those of other major highways in this region of the country. August is the month of greatest traffic movement, and that month also had the heaviest daily movement of traffic on record. On August 1, 1953, a total of 98,021 vehicles used the Turnpike. Manual volume counts taken over a three-hour period on this day at several key points on the highway yielded volume counts as high as 1400 vehicles per lane per hour. These volumes, of course, were accompanied by a reduction in average operating speeds. Days of such heavy traffic flow point up the need for expansion of the Turnpike to provide additional traffic capacity. With the operating speeds in existence on the Turnpike, an hourly lane volume of 975 vehicles is considered to be the satisfactory maximum. On August 1, 1953, at least one section of roadway was operating nearly 44 percent above its theoretical design capacity. Further traffic studies are now underway to provide the background information necessary before the expansion program may be initiated. By April 1956, in all likelihood, we will see a six-lane high-

● **NORTHBOUND overhead sign on the approach to the Elizabeth dual-dual area is typical of this type of installation.**

● **THIS is an aerial view of the interchange at the Lincoln Tunnel.**

way from the George Washington Bridge to the Camden-Philadelphia area.

The Turnpike's Safety Record

Although the year 1953 saw a 22 percent increase in the number of vehicles using the Turnpike and a 13 percent increase in vehicular mileage over 1952, the overall safety record showed a marked improvement. Accidents showed a reduction of 18 percent, injuries 20 percent, fatal accidents 21 percent and fatalities 23 percent resulting in a fatality rate of 4.14 per 100 million vehicle-miles. This rate is approximately 60 percent of the national fatality rate based on current estimates. The accident and injury rates are but a small fraction of the corresponding national rates.

The favorable comparison that may be drawn between the safety records of the Turnpike and the national records results from three primary reasons: *Design, Enforcement* and *Publicity*. Each of these have contributed in their own way to lessen the striking economic loss and human suffering that result from highway accidents.

Design has given us full control of access with all cross traffic movements grade separated, flat grades, gentle slopes, long sight distance, superior cross section with wide shoulders, good all-weather travel surface and adequate acceleration and deceleration lanes to handle safely traffic entering on or exiting from the traveled roadway. These features, and many more, plus a uniform and standardized Interchange signing installation, tend to make a safer highway facility.

Enforcement: The burden of enforcement of traffic regulations on the highway rests with the 77-man complement of the New Jersey State Police who are assigned to the New Jersey Turnpike. This force maintains 24-hour patrols, 365 days a year over the 118 miles of highway. There are a minimum of 13 patrols on the highway at all times and more during periods of bad weather or unusual occurrences requiring stepped up patrols. Ideally, this yields one patrol car for each nine mile section of roadway, which undoubtedly makes the Turnpike the best policed major highway in the world. However, it must be remembered that the police, in addition to their enforcement work, carry additional responsibilities. Following injury accidents, they are the first ones on the scene to render first aid. During bad smoke and fog conditions, they act as the eyes for the motorists by leading convoys of cars through the affected areas. Also, in their routine patrols, they come upon many motorists in distress due to vehicle breakdowns. During 1953, they handled in excess of 42,000 aids to motorists, or an average of 115 per day. It is of interest to note that 37 percent of the total number of breakdowns is a result of mechanical failure (i.e. fuel system, ignition, crankcase, etc.); 23 percent of the breakdowns were because of flat or blown tires and 22 percent of the total were vehicles which ran out of gas. The remaining 18 percent were for various other miscellaneous reasons.

Publicity: The Turnpike has had its share of publicity. It is understandable that even one bad accident or a so-called chain reaction (multiple vehicle) accident receives a wide degree of coverage that frequently attains national radio and newspaper distribution. It is believed that this publicity can have great educational advantages if properly presented to the readers and listeners. It is an unusual accident that does not have a background of some human failing that, if properly presented to the public, would have educational value. Un-

● **CHANGING speed sign message.**

● **AERIAL view of New Jersey Turnpike in the northern industrial area.**

fortunately, we see little publicity, except from safety organizations, that is presented with this in mind. Some of these failings are: fatigue or sleepiness, inattentiveness, poor driving technique and excessive speed for conditions (not necessarily speeding). It would be well to examine each of these a little more closely.

Fatigue is synonymous to physical or mental weariness and a direct inducement to sleep. Many of our most serious accidents have resulted from drivers who, attempting to force themselves beyond their physical endurance, have fallen asleep and lost control of their vehicles. A sleepy driver can never be a safe driver for all his senses are dulled and his brain is anesthetized. A person realizing the dangers of fatigue when at the wheel of a vehicle has ample warning of this trait. It is not something that overcomes a person without warning, but is cumulative with time. Once aware of his condition the informed and safe driver will seek a safe place to park his car and revive his lost powers. Needless to say, the shoulder of the road is not the proper place to stop and sleep, especially at night. To do so invites disaster. The Turnpike has received some criticism because of the ban placed upon stopping or parking on the shoulder except for breakdown purposes. It was learned during the early days of Turnpike operation that to allow vehicles to do so was disastrous and was an invitation to serious collisions. Since the establishment of this regulation, accidents involving vehicles parked on the shoulder and stopping or starting up from the shoulder have been almost completely eliminated. For those that find it necessary to sleep while enroute along the Turnpike, larger parking areas for cars and trucks have been constructed in the Service Areas, and it is only a matter of minutes to any one of them. These have been illuminated better to safeguard the driver and his vehicle.

Inattentiveness to driving responsibilities has been another leading cause resulting in bad accidents. When traveling at a speed of 88 feet per second on the Turnpike, it can take less than one second to get into serious trouble. Driving on a long sweeping open roadway requires just as much, if not more, alertness than driving during the rush hour period in a large city on a crowded boulevard.

Poor Driving Techniques refers to such things as improper applications of brakes on wet or icy pavements, following vehicles too closely and locking the wheels of a vehicle when a blowout occurs. All of these have caused serious accidents on the Turnpike. Following a vehicle with a minimum headway has resulted in the most sensational type of accident. This has been commonly referred to as the "chain reaction" type accident. Anyone who takes the time to observe traffic on a high speed facility will frequently note cars traveling in groups or queues and then relatively long stretches with few cars. When the driver of the lead vehicle of a queue runs into an unexpected or hazardous condition, he applies the brakes and slows down. Following drivers are frequently unaware of the condition ahead as they have been following so closely that their view is blocked. Due to the short spacing between vehicles, they do not have time to reduce speed or stop before colliding with the vehicle ahead. When proceeding at highway speeds 150 feet should be the minimum spacing between successive vehicles. A greater spacing of course is advisable from the safety standpoint. Most people need this much distance to react properly and some a good deal more. As the delineation on the edge of the shoulder of the Turnpike is spaced on 150-ft. centers, it is a good rule of thumb to stay at least two delineators behind the car in front.

Special Operating Procedures

During the past full year of operation, it was necessary to reduce the speed limit on the Turnpike between various interchanges to 35 miles per hour one hundred and five times, sometimes for only a matter of minutes. This was necessary due to weather and atmospheric conditions such as smoke, smog, fog, snow and wind. The reduction in speed is applied only to the general area in which the hazardous conditions exist and is removed as soon as conditions clear enough to afford safe movement of traffic at the normal limit.

Every practical means has been tried to warn motorists approaching danger areas. Seventeen large flashing neon signs have been erected on the northern end of the Turnpike, which is the area most generally affected by adverse weather conditions. These signs, when activated, flash a message "Drive Slow" in 16-inch neon tube letters. Other messages to warn of the bad condition may read "FOG", "ICE AND SNOW" or "ACCIDENT AHEAD". Even under adverse weather conditions the red flashing glow of these signs may be seen at distances of a half mile or more. The complete message is readable at 500 feet. These signs have proved effective in causing reductions in speed.

No suggested safe speed is made on these signs as it is impossible and inadvisable to attempt to fix such a speed. During periods of smoke and fog visibility changes so rapidly that a fair condition (100 feet or more) may change to an impossible one (less than 25 feet) in less than five minutes time. Responsibility of decision on the proper speed of travel under these conditions must remain with the driver and is governed by his capabilities and physical limitations. During conditions mentioned above, every possible means is taken to provide safe passage. Verbal and printed warnings are issued at the Interchanges of the hazardous condition ahead. Police patrols are stepped up to keep closer surveillance of conditions and advise headquarters of any changes which would

require further precautionary measures. Responsible operating personnel are alerted and called in to supervise the operation if conditions warrant it. In case of a spot (very localized) fog or smoke condition, such as frequently occurs in the meadow areas of north Jersey, dismounted police patrols are placed at approaches to the fog. Such warning devices as railway flares, pot torches and spot lights are used by the Police to attract the attention of the approaching motorist so as to slow him down to a safe speed. Flares are frequently set on the edge of the pavement throughout the danger area to act as guide beacons for the motorists. All of these vital steps have been used to safeguard traffic movements on the Turnpike. It is hoped that some day remedial measures may be available to check the conditions requiring this action.

● **TYPE of sign used on entrance roadways to the New Jersey Turnpike.**

Presently, the Authority has several safety projects under study. Among these are a headlamp glare study, fog study and a median barrier study. It is the hope of the Authority that the results of these undertakings will provide basic data that may be applied to past and future highway design in making all highways safer for road users.

Integrated Signing Program

The Turnpike signing program is comprehensive in scope. This program covers the fundamental types of signing: Regulatory, Warning, Informational or Guide, Directional or Destination on the Turnpike; and, in addition, trailblazing or routing traffic desiring to use the Turnpike to the nearest point of access from all over the state.

The regulatory signs are typified by the speed limit signs placed at five-mile intervals along the full length of the Turnpike. These signs are of special interest for they are designed to permit the changing of the 60-mile per hour message to read 35 miles per hour. During periods of adverse weather when the 60-mile per hour limit is judged unsafe by the Police, the 35-mile per hour signs are affixed over the standard signs to advise motorists of the reduced speed in force. A red colored reflectorized sign is used under these conditions in place of the standard white or silver reflectorized message. In addition to changing of the speed limit signs, the lowered speed limit is displayed at all toll booths; special toll tickets are issued advising of the hazardous conditions; and verbal warnings are issued at interchanges by the Toll Collectors. Another important regulatory sign is the one stating that stopping or parking along the shoulder of the roadway is prohibited except for repairs. These signs are erected at frequent intervals along the shoulder and under all bridges crossing the Turnpike—places which have proven to be favorite parking places for motorists.

The warning type signs are generally not needed on the Turnpike. An exception to this is the posting of advisory speed signs and curve signs on the exit ramps.

There are a great many informational signs located at Interchanges along the roadway and in the ten service areas. Recently, signs were erected adjacent to the onbound roadway at all Interchanges to notify motorists that the speed limit is enforced not only by trooper-manned patrol cars, but also by the use of radar speed recorders.

A minimum of four signs is used in advance of all Service Areas and at some there are as many as eight signs on the approach to an area. Generally, the pattern for signing a Service Area is as follows: A two-mile advance warning sign; a one mile sign that food and car service is available one mile ahead; another sign at the start of the deceleration lane 1200 feet in advance of the service area entrance roadway; and the last sign in the nose of the entrance roadway island. This acts as a confirmatory type sign for those desiring to use Service Area facilities. As many as four additional signs are used ranging from 3 to 36 miles in advance of distant service areas. The signs described above are all elliptical in shape varying in size from 8 feet by 14 feet to 11 feet by 18 feet.

Generally, five signs are used for advance warning to the motorist who is approaching a point of egress from the Turnpike. These signs appear in the following order. The first, two miles in advance of the exit ramp, gives the distance and exit number in addition to the distance to the following interchange. The exit number designation has been found to be most satisfactory as it simplifies the signing of an interchange and is considerably less confusing than place names. The second sign is one mile in advance of the exit roadway ramp; it indicates that exit number, distance to the exit ramp, and the name or names of the major cities or destination. The third sign repeats popular destinations, routes or areas served by the Interchange. The fourth sign indicates the beginning of the 1,200-foot deceleration lane and repeats the interchange number. The last sign, located in the

(*Continued on page* 126)

● **THIS type of neon sign is adaptable for a variety of warning signals.**

FIRST SOIL CEMENT STREETS IN KENTUCKY

Makes First use of NEW FINANCING LAW

N. W. NEAL,

City Engineer, Henderson, Ky.

BY building 26,900 sq. yds. of soil-cement streets late last year, Henderson, Ky., not only became the first city in the state to use soil-cement for street paving but also the first to use a new Kentucky law setting up procedures for financing public improvements through assessments. This law enables cities to assess abutting property owners for the cost of improvements. The property owner has the option of paying for the improvement in a lump sum or spreading the cost over a period of 10 years. Construction may be done in stages or complete in one job. If complete, no further assessments may be made for improvements, except widening, for a period of 15 years. This means that any street paving must be sufficiently high type to last at least 15 years.

A section in the southwestern part of our city was in great need of paving and this section formed the core of our street paving program. Although this area had grown rapidly following World War II, developers had not built permanent streets due to lack of adequate building codes requiring them to do so. Residents demanded that the city provide streets and sidewalks. For our original program we selected 20 streets.

From the beginning we favored concrete for the streets but property owners demanded that costs be kept as low as possible. After studying various designs, we set up three alternates: 1. 5-in. uniform concrete with integral curb and gutter; 2. 6-in. soil-cement base with 1½-in. bituminous plant-mix surface and 24-in. gutter with 4-in. rolled curb; 3. Two-course penetration macadam, each course 3 in. thick, topped with 1-in. plant-mix surface plus the 24-in. gutter and 4-in. rolled curb.

Widths of the streets varied from 18 ft. to 36 ft., with an average of about 30 ft. It was necessary that all the streets be regraded and drainage provided.

Acceptable bids were received in June, 1953, and the contract was let to the R. B. Tyler Co., Louisville, Ky., on the soil-cement alternate. Total price was $126,858.90 for excavation, curb and gutter, drainage, and paving. Unit prices were:

Roadway excavation	$1.25 cu.yd.
Curb and gutter	2.45 lin.ft.
6-in. soil-cement base	0.60 sq.yd.
1½-in. plant mix surface	1.00 sq.yd.

Construction got under way at the end of July and the streets were ready for soil-cement processing the first part of October. Soils in place varied from silty to sandy loams requiring 10 to 12 percent cement. The cement content necessary was determined in tests made by the Kentucky Department of Highways laboratory at Frankfort.

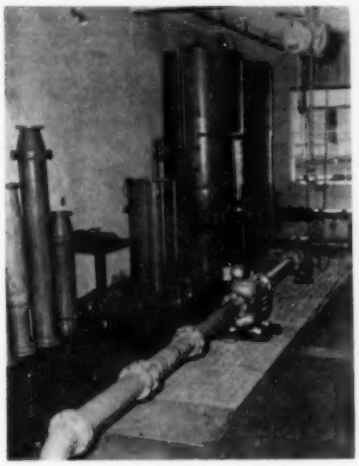
Before construction began, manholes and inlets were removed and the openings boarded up. After processing was finished, soil-cement covering these holes was dug out and manhole frames and inlets were replaced and backfilled with concrete.

Construction of soil-cement normally began with scarification of the roadway soil followed by a pass with a Seaman Pulvi-mixer. Cement was spread by a T. L. Smith cement spreader and mixed in the dry soil by the Pulvi-mixer. Water was added by gravity-feed water distributors and mixed in increments until optimum moisture content was reached.

The mixture was compacted by sheepsfoot and rubber-tired rollers. A finger weeder drawn by a Ford tractor was used to remove surface compaction planes left by the sheepsfoot roller before final rolling. Loose material present on the surface was removed by scalping with a motor grader; 0.2 gal. per sq. yd. of asphaltic emulsion was used to seal in moisture for cement hydration. The 1½-inch asphaltic concrete pavement completed the job.

● SOIL-cement was mixed with a Seaman Pulvi-mixer after initial preparation by scarifying and mixing.

● BEFORE final rolling with pneumatic-tired rollers, the surface was shaped to the finished grade and crown.



● **SIMPLE arrangements of pipes and tanks for testing a large meter.**

For LARGE SIZE WATER METERS---An ELECTRONIC TESTER

LARGE meters may account for only a small percentage of the total revenues of a water department but under-registration of such meters may be responsible for a considerable part of the unaccounted-for water in a system. Thus, the maintenance of large meters is of major importance due to possible under-registration of the very large quantities of water used. Though most water departments make determined efforts to repair leaks in mains as quickly as possible, large meters are, in many cases permitted to under-register grossly.

An electronic water meter tester was installed by the City of Long Beach, Calif., earlier this year. This meter tester is based on designs and patents of Richard Bennett, for many years connected with the Water Department of Phoenix and Tucson, Ariz. It is reported that this equipment will operate with a high degree of accuracy, eliminating all human errors, unless intentional, and all water hammer, regardless of the quantity or velocity of flow. It will test flows electronically, of any magnitude or velocity, maintaining the desired rate of flow without increase nor diminution in magnitude or velocity from beginning to end of the test. It will operate on meters of any size and in all ranges of flow.

Small meters are usually tested by methods employing a quick-closing valve. Such valves may set up water hammer, but with the small flows employed this is usually not of a serious nature. The use of quick-closing valves for large meters, however, may permit destructive water hammer, thus necessitating employment of slow opening and slow closing control valves and creating measurement errors.

Means have not been available for making critical tests of compound meters in the change-over rate-of-flow areas. Such tests, to be accurate, must be made at a uniform continuous rate of flow in order that the low register does not record the low flows at the beginning or the end of the test, which are due to slow opening or closing to avoid water hammer, of the quick-closing valves. The electronic meter tester avoids such errors.

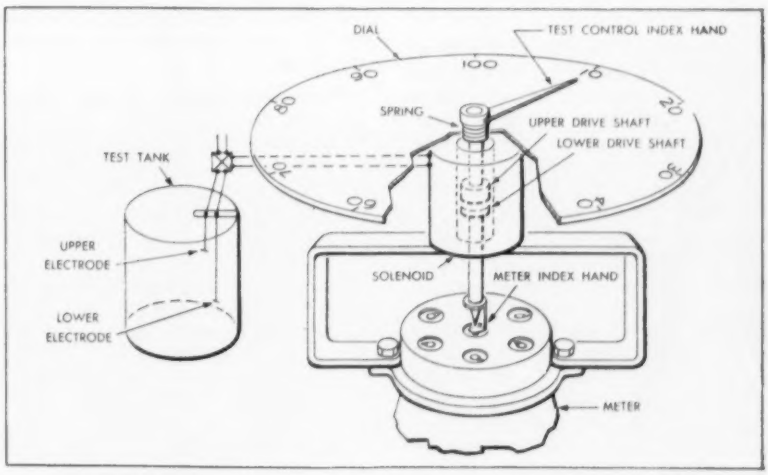
According to Mr. Bennett, the principle of race track timing was used to develop the tester, as follows: Assume a race track, with an electric timing device to determine the actual elapsed time required for the automobile to make one circuit of the track. The car is started at some distance from the zero point; it is accelerated faster and faster until the moment it reaches the starting line when the electric timing device notes the exact time. The car travels at maximum speed one lap around the track; as it crosses the finish line, the electric timing device notes the exact moment. The auto now begins to slow down, until finally it stops; the run has been completed. The speed of travel for the single circuit can be computed without reference to the acceleration and deceleration periods. These had nothing to do with how fast the car traveled during the test run of the circuit. This is the exact method by which this water meter tests meters for accuracy of registration.

The electronic water meter tester separates accuracy tests into three parts:

(1) Slowly opening the main control valve of the meter permits a gradual increase in "rate of flow" until just before the actual meter accuracy test begins and the water is flowing at the exact desired rate into the test tank. When the rising water touches the lower electrode in the tank, the actual accuracy test begins.

(2) At the instant the water reaches the lower end of the lower electrode, an electrical impulse energizes a solenoid, causing the test control index hand to revolve exactly in unison with the water meter index hand to which the tester is attached. This action continues until the water reaches the lower end of the upper electrode. During the test the water has been flowing at exactly the desired rate of flow; no valves have been manipulated during the actual test period. When the water reaches the lower end of

(*Continued on page* 103)



● **PRINCIPAL component parts of the electronic water meter tester.**

SANITARY ENGINEERING RESEARCH

and PROGRESS in Maryland

The excellent report of the Sanitary Engineering Division of the State Board of Health for the year 1953 contains many items of interest. The data in this article are from that report, supplemented by personal communications from George L. Hall, Director of the Sanitary Engineering Division.

Coagulant Studies for Iron Removal—Coagulation studies were continued at the municipal filter plant at Annapolis, Md., using various coagulants including clay, to determine if a more effective floc for the removal of iron from the aerated water could be formed. Although the use of iron salts appeared to produce the most efficient results with water obtained from the well sources of supply, alum as a coagulant was found to be satisfactory in most instances and particularly when all or a part of the raw water came from the surface stream. These studies also included the use of lime alone to raise the pH in the aerated water so that the oxidized iron would settle readily without the use of alum. It was found, however, that in order to obtain satisfactory results, the pH of the water had to be raised above the carbonate-stability point.

Sampling to Determine Cause of Bacteria—An extensive survey and sampling program was undertaken by the Division of Sanitary Engineering in an effort to determine the cause of the intermittent occurrence of unsatisfactory bacteriological results at Berlin, Md. Some years ago extensions were made to the water distribution system and sections thereof in the center of town were reinforced by the installation of new mains parallel to the old ones and connected thereto at street intersections. The investigation indicated pollution was prevalent to a degree throughout the distribution system but it was not possible to determine the source. As a result, chlorination of the water was recommended. An automatic proportioning chlorinator was ordered for the main pumping station and a hypochlorinating unit for the third well, which is used as a standby and during emergency periods. At the end of the year, all of the equipment had been delivered but the installation had not yet been completed.

Emergency Water Supply Contamination—A large fire occurred in Sharptown, Md., and as a result it was necessary to take water from the Nanticoke River to help out in this emergency. Water was pumped from the river into the nearest fire hydrant on the water distribution system. An investigation of this condition was made by engineers of the Sanitary Engineering Division during the fire and the chlorine dosage to the town water supply was increased. During the fire, which was along the water front, the water level in the elevated storage tank did not drop appreciably. It was apparent that only the water in that part of the distribution system in the vicinity of the fire had in any way been affected by the polluted river water. The results of the investigation by the sanitary engineers showed that the water in the system within two days after the fire was safe for drinking purposes. Residents in the community were warned, however, to boil water during this period and until the water throughout the distribution system was found to be of safe bacterial quality.

Fluoridation—There are seven fluoridation installations now in operation in Maryland, as follows: Two each in Hagerstown, Washington Suburban Sanitary District and Baltimore City and one in Bel Air. These serve a total of approximately 1,600,000 persons, or 68 percent of the State's population. A summary of the results of samples taken from the distribution systems during 1953 where fluoridation is in effect indicate that close control is given to the operation of the feeding equipment in an attempt to maintain between 0.9 to 1.0 ppm of fluorides at all times in the water delivered to the consumers. In the Sanitary District 660 samples showed an average fluoride content of 0.885 ppm; in Baltimore, 1,370 samples showed 0.914 ppm; in Hagerstown 669 samples showed 0.996 ppm; and in Bel Air 1,365 samples showed 0.954 ppm. Natural fluorides in the various raw waters being treated range from a trace to 0.4 ppm. The quantity of natural fluorides vary with the percentage of surface runoff to the total

stream flow, and is apparently greater at times of lower surface runoff.

Biofilter for Bel Air—A contract for the construction of additions to the sewage treatment plant of Bel Air, Md., was awarded last year. The new plant, designed for a population of 6,000 and an average flow of 0.6 mgd, includes a comminutor, primary sedimentation tank, rotary distributor for the existing trickling filter to convert it to a biofilter unit, secondary sedimentation tank and a separate sludge digestion tank. The old primary Imhoff tank is converted to a sludge-storage tank and the final Imhoff tank is now a chlorine-contact chamber.

Subdivisions—Changes have been made in controlling the sale of land for subdivision purposes in Baltimore County through the cooperation of the Baltimore County authorities, including the Baltimore County Health Department, and State Sanitary Engineering Division. The principal factor involved was the requirement that the results of soil percolation tests must be available for each lot in a subdivision before the plat is approved by the Baltimore County Planning Commission. In the past when subdivision plats were approved after spot-testing of the soil, it was found, in many cases, that some of the lots were entirely unsuitable for underground sewage disposal. Under the plan agreed upon all lots where soil tests are not satisfactory for underground sewage disposal, will be eliminated from the approved plat until public sewers are available. The regulations are now being enforced by the county health departments.

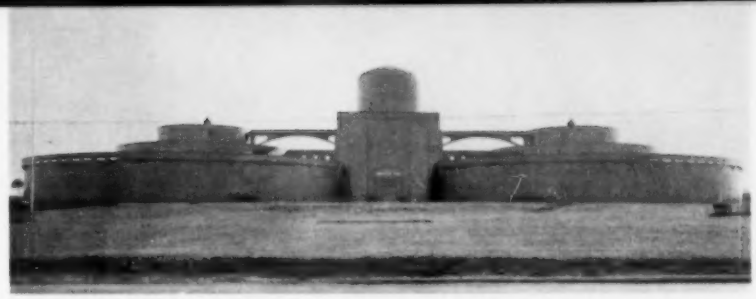
Incineration Operation — The Reedbird Avenue Incinerator, Baltimore, Md., with a rated capacity of 600 tons per day, destroyed 190,437 tons of mixed refuse and 12,831 tons of market refuse, street dirt and dead animals, or a total of 203,268 tons during the year. The average daily destruction of refuse was 651.2 tons, based on a 24-hour day, 6-day week operation, or 108.6 percent of the rated capacity. The amount of refuse destroyed in 1953 was 11.9 percent more than during 1952, and 22.7 percent over 1951. The increase in the total amount of destroyed refuse resulted from the installation of mechanical stokers early in 1952 which made it possible to burn refuse in excess of the 600 tons per day rated capacity. There were 419 tons of material salvaged at this plant during 1953, consisting principally of glass and metals. Smoke density for each month was less than #1 on the Ringlemann Chart. Total cost of operation was $307,957.11, revenue from salvage was $14,473.47, giving a net cost of $293,483.69, or an operating cost of $1.44 per ton.

The Frederick refuse incinerator, which has a rated capacity of 60-tons per day, destroyed 8,606 tons of mixed refuse and 1,856 tons of sewage-sludge cake, or a total of 10,472 tons of material during the year. Ash production was 566 tons which represents a total destruction of material of approximately 94.6 percent. The increase in material destroyed in 1953 over that during 1952 was 624 tons, or 6.3 percent. Increase in ash produced was 12 tons, or 2.2 percent. The total amount of refuse and sludge cake incinerated represents an average daily destruction of 33.55 tons based on a 24-hour, 6-day week operation. Total burning time for each furnace was 2,586 hours, or an average of 2.01 tons of material for each hour of furnace operation. No major repairs were made to the furnace during the year. Approximately 3,500 pounds of coal was used as auxiliary fuel. The operating cost of incineration was $1.90 per ton, not including fixed charges, and the per capita cost was $0.86, based on an estimated population of 20,000 persons served.

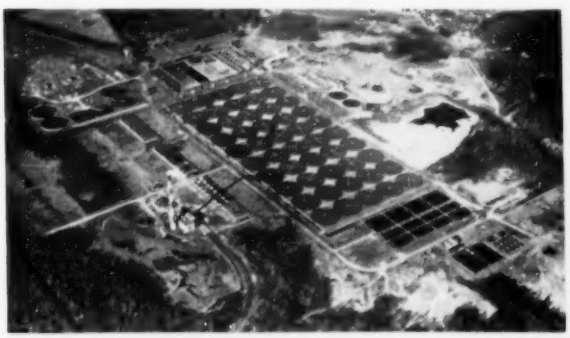
The 125-ton incinerator at Salisbury destroyed 7,428 tons of mixed refuse during 1953, or an average of 23.8 tons per day, 6-day week operation. The average daily amount destroyed was 19.0 percent of the rated capacity. The total furnace hours for the year was 2,071.2 with an average of 3.59 tons burned per furnace hour. Ash production was 1,494 tons representing a total reduction of material destroyed in 1953 of approximately 80.3 percent. The total number of man-hours was 13,861, which represents 0.537 tons of refuse burned per man-hour. The total cost of refuse disposal was $22,000, or an operating cost of $2.96 per ton, not including fixed charges.

The 225-ton incinerator at Lyttonsville destroyed a total of 34,847 tons of refuse, or approximately 111.7 tons per day, based on a 24-hour, 6-day week operation.

The 70-ton incinerator at Bladensburg destroyed a total of 18,429 tons of refuse, or about 59.1 tons per day, based on a 24-hour, 6-day week operation. The total cost of operation was $2.94 per ton. The operating cost not including fixed charges was $2.66 per ton.



● **ATTRACTIVE** appearance features the Patuxent water filtration plant.



● **BACK RIVER** sewage treatment works, Baltimore, Md.

● **ONE** of many modern plants at State Institutions.

● SINGLE-pass stabilizer completes the job in one operation—pulverizes the soil, proportions the mix, and surfaces.

SOIL STABILIZATION *with*

LEO J. RITTER, JR.

SOIL stabilization is basically a process by which an existing soil is rendered capable of withstanding the stresses which may be imposed upon it by traffic loads under all weather conditions. Principal types of soil stabilization include mechanical stabilization (See *Public Works*, March, 1954), soil-cement, and bituminous soil stabilization. This article deals only with the latter type.

Fundamental Factors—Bituminous soil stabilization is a process by which a controlled amount of bituminous material is mixed with an existing soil, an aggregate material, or a combination of soil and aggregate to form a stable layer. The bituminous material may be either asphalt or tar, although asphalts are most frequently used. In general usage, bituminous materials which require little or no heating for application are preferred.

The bituminous material may be incorporated with an existing soil for one, or both, of two general purposes. One of these purposes is to increase the shearing strength of the soil by supplying cohesion through the cementing action of the bituminous material. The second, which is important in cases in which exposure to water after construction is a problem, is to provide some "waterproofing", thus aiding in retaining a higher shearing strength than would be possible otherwise. Detrimental volume changes may be controlled or eliminated.

Uses—Bituminous soil stabilized mixtures have been used for a wide variety of purposes by many different agencies in the United States. Principal uses include improving the bearing capacity of an existing subgrade soil in order to reduce the thickness of pavement required to support heavy wheel loads; the making of an otherwise unsatisfactory base course material into a satisfactory one; and the creation of a "working floor" for construction operations on a cohesionless sand subgrade. Under certain conditions, mixtures of this type may serve as wearing surfaces for the support of very light traffic. Bituminous soil stabilization lends itself well to stage construction, in which a road or street is improved gradually in order to take care of increasing traffic demands.

Conditions for Use

The basic condition for successful soil stabilization is low cost; satisfactory service should be provided at minimum overall cost, including both initial costs of construction and annual costs of maintenance and depreciation. Thus, as with soil-cement, consideration should not be given to bituminous soil stabilization until it is certain that successful mechanical stabilization is not possible at lower cost. Obviously, the greatest usefulness of this type of stabilization is in areas where aggregates suitable for use in mechanical stabilization are not economically available.

Successful construction of a bituminous stabilized mixture is dependent upon thorough pulverization of the soil and the production of an intimate mixture of soil and bituminous material. This generally limits this type of work to essentially cohesionless soils which are easily pulverized and mixed, including sands, sandy and gravelly soils, and the more friable silts. Cohesive soils, including fairly heavy clays, have been stabilized successfully with bituminous materials. However, such a procedure is frequently expensive and difficult to accomplish in the field because of the difficulty of pulverizing these soils. The stabilizing of plastic soils by mixing with bituminous material thus is not generally recommended. An "oiled earth surface", capable of carrying very light traffic with continual maintenance, may be produced by applying liquid bituminous material to the surface of a plastic soil deposit. This method is not described here, and reference should be made to the bibliography (1) at the end of this article for detailed information.

Soils and Bitumens

For best results in many cases, the moisture content of the soil must be reduced to a fairly low value before the bituminous material is applied. The soil-bitumen mixture also must be thoroughly cured before compaction. These factors make it desirable to carry out this type of construction in good weather, preferably during the warm months of the year.

● SELF-propelled Pulvimixer follows closely behind the asphalt distributor to prevent runoff of bituminous material.

BITUMINOUS MATERIALS

As indicated previously, soils which can be readily stabilized with bituminous materials are those which can be easily pulverized and mixed with available equipment. The Committee on Soil-Bituminous Roads of the Highway Research Board recommends (2) that the soil (other than cohesionless sand) be reasonably well graded from coarse to fine; have a maximum size less than one-third the thickness of a compacted lift; not more than 50 nor less than 10 percent passing a No. 200 sieve; a liquid limit less than 40; and a plasticity index less than 18. Other requirements apply to cohesionless sands and are presented in detail in the report of this committee. Experience on civilian airfields in the United States (3) indicates that the soil should not contain more than 45 percent of material passing the No. 200 sieve, the liquid limit should be less than 30, and the plasticity index less than 10. Soils which contain large amounts of organic material or mica are not suitable for stabilization.

Each of the three broad classes of liquid bituminous materials—liquid asphalts, asphalt emulsions, and road tars—has been used. The choice of the type of bituminous material to be used is dependent upon many factors, including local availability and cost, soil type, weather conditions, mixing equipment, and others. Cutback asphalts are very widely used. Rapid-curing cutbacks—grades RC-1 through RC-4—are recommended for use in very sandy soils, those which contain a minimum of silt-clay material. Medium-curing cutbacks—grades MC-1 through MC-4—are used with soils that contain more material passing the No. 200 sieve. In some areas, particularly in arid regions, slow-curing liquid asphalts are used with soils which have as much as 30 to 40 percent material passing the No. 200 sieve. Asphalt emulsions, of mixing grade, are used in some areas and are best suited for use with very sandy soils. Suitable grades of road tars, particularly RT-3 through RT-6, are used in base construction in areas where they are plentiful and cheap. Their use is not recommended in surface courses.

The grade of bituminous material to be used, after the type has been decided upon, is dependent primarily upon the mixing equipment to be used. If the equipment is light and considerable time will be required to effect proper mixing, a light bituminous material containing a large amount of solvent must be used, so that the material will remain liquid during mixing. On the other hand, if an efficient travel plant is used, a heavier grade can be utilized, since less time is required for mixing. In any event, the heaviest grade which can be mixed adequately should be used.

Amount of Bituminous Material

The amount of bituminous material used in a soil stabilized mixture generally is from 4 to 9 percent by weight. The amount of bitumen generally increases with an increasing amount of fines. Laboratory procedures have been developed for determining the optimum amount of bitumen to be used with a given soil. Various procedures are used by different agencies, and there is no particular agreement as to which is best. Most methods involve two series of tests: One series to determine the stability of the mixture when subjected to stress and the other to determine the absorption characteristics of compacted specimens. Tests of both types would be performed upon a number of specimens containing different amounts of bitumen. The optimum bitumen content is determined by analysis of test results.

Test Procedure

A test procedure used by some organizations is "Tentative Method of Testing Soil Bituminous Mixtures", ASTM Designation D915-47T. When this procedure is used, the following criteria are recommended (1):

Extrusion value before absorption test—1000 lbs. minimum

Extrusion value after absorption test—400 lbs. minimum

Expansion during absorption test —5 percent maximum

All the above are for tests on uncured specimens.

Thickness—The required thickness of a bituminous soil stabilized layer is dependent upon the loads which it will carry, the subgrade soil, climatic and drainage conditions, and other factors. The minimum recommended thickness is 6

inches, with base course thicknesses commonly being 6 to 9 inches.

Provision of adequate drainage and proper preparation of the foundation soil are essential to this type of construction, as with many others. Following this, basic steps which are undertaken include pulverizing the soil, applying the bituminous material, mixing the component materials, aerating the mixture, compaction, and finishing. Construction may be carried out by "road-mixing", using conventional tools, by use of a traveling plant, or occasionally by the use of a central plant. Central plant mixing will not be considered here.

Pulverizing the Soil—In conventional road-mixing operations, the steps of pulverizing, mixing, and aerating are carried forward with essentially the same tools. Principal items of equipment of value in these operations are a blade grader, rotary speed mixer, and farm tools, particularly disc and heavy-duty, spring or spike tooth harrows. The soil is loosened and pulverized until at least 75 percent of it will pass a No. 4 sieve; the soil should be uniform in composition and moisture content when pulverization is complete. In general, moisture contents should be quite low before a cut-back asphalt or road tar is applied to the soil, generally less than 2 percent. Some sands can be handled at moisture contents somewhat in excess of this, and the moisture content can be somewhat higher when asphalt emulsions are used. The principal purpose in securing a low moisture content is to insure that the soil particles are coated with the bituminous material. Water is sometimes added to facilitate mixing and compaction, but must be removed eventually, before construction is complete.

Applying the Bituminous Material—The bituminous material is applied by a pressure distributor. The preferred rate of application is between ¼ and ½ gallon per square yard. Mixing operations generally follow directly after the application of bituminous material, although it may be desirable in some cases to let the material "soak in" before mixing begins. The bitumen is frequently cut in and distributed through the soil by the use of a rotary mixer, multiple-blade drag or disc harrow, this operation being carried out as a first step in mixing. Successive applications are made until the desired amount of bituminous material has been incorporated with the soil.

Mixing and Aerating—Mixing operations can be carried out by a blade grader passing a windrow from side to side. Harrows speed up the process. However, the best conventional tool for aerating and mixing is undoubtedly a high-speed rotary tiller, such as the Seaman Pulvi-Mixer. Mixing and aerating must be continued until a uniform color and texture is secured, and the material is in condition for laying. It is generally advisable to continue aeration until virtually all the volatile materials have been removed, in order that the mixture will "cure" and harden properly after compaction. As a final step, the material (or a portion of it) is spread in a uniform layer, ready for compaction.

Traveling Plants—When such equipment is available, traveling plants offer certain advantages over road-mix processes. These advantages include better control of mix proportions, greater uniformity of the mix, and greater speed, with consequent less dependence upon favorable weather conditions. They are of two general types. One type, such as the P & H Single-Pass Soil Stabilizer, cuts and pulverizes the soil, proportions soil, bitumen, and water (if used), mixes the materials, and deposits them in a uniform layer, ready for compaction. The other type, like the Barber-Greene machine, picks up the soil from a windrow, adds the requisite amount of bitumen, mixes the materials, and deposits them behind the machine in a windrow. Several different types of these machines are available from various manufacturers; their use is highly recommended on large projects and in situations in which the comparatively large investment in a specialized machine is possible.

Compaction and Finishing—Compaction of a bituminous soil stabilized mix is carried out best in thin layers. The mixture is spread from a windrow at the side in a layer not more than 2 inches thick. Each layer is rolled with pneumatic-tired rollers until a satisfactory degree of density is secured. The desired density is usually established in the laboratory during the design of the mix. The liquid content of the mass must be below optimum during compaction. The process is then repeated until the specified thickness has been obtained. Blading and rolling operations are continued until a tight, well bonded, smooth surface is obtained.

Wearing Surface

It is recommended (1) that a very light application (about 1/10 gallon per square yard) of bituminous material be made to the surface of the stabilized mixture 48 hours after the base course is completed. This is to seal the surface against the penetration of water and to prevent loss of material due to surface abrasion. At least ten days should elapse before a wearing surface is placed on the base, in order that the mix may have time to cure. The wearing surface may be any one of a number of different types. However, either a single or double surface treatment is recommended for roads and streets carrying light traffic. The thickness of the pavement may be increased later, if necessary, by the application of a hot plant mix.

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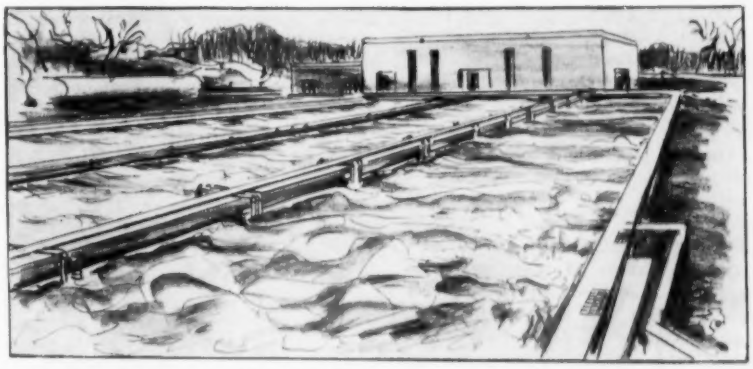
● MOTOR graders can be used for mixing and aerating the soil-bitumen.

TYPES OF DETERGENTS and BUILDERS CONTRIBUTING to WASTE TREATMENT PROBLEMS

EARNEST F. GLOYNA

Associate Professor,

The University of Texas



There are three general types of detergents—anionic, cationic and non-ionic. The most widely used are the anionic; and in this class almost as many synthetic detergents are sold as soap. The quantity and the types of synthetic detergents entering sewers and eventually passing into drinking water systems are increasing. This is the first of two articles. Part II will list some of the effects of such detergents on waste treatment and on water use.

DETERGENCY is a complicated phenomenon and the washing agents used in commercial laundering, combined with the surface-active compounds used in every day domestic life, produce a final combined effluent of great complexity. Detergents may cause operational difficulties in sewage treatment plants. Soap and grease adhere to the sewage solids and rise to the surface in the settling tanks. Some of the detergents may create a nuisance problem due to foaming while others, along with complexing and chelating agents, may be antagonistic to the biological life in sewage treatment plants; some may create additional problems when they find their way into a domestic water supply.

The wide variety of new synthetic detergents will probably continue to increase the soapy-waste water problem. Due to the gradual increased cost of soap in this country and the continued progress in by-product utilization programs of the petro-chemical industry, increased amounts of synthetic detergents will be used. Practically all of the self-operated automatic laundries use some form of synthetic detergent, while some large laundries are using synthetics, depending somewhat upon freight costs and suds retention capacity of the synthetic detergent which happens to be competitive with soap in the local markets.

Classification

Chemically, detergents are compounds with a hydrophilic and hydrophobic position which tend to accumulate in an oriented layer at aqueous interfaces with the hydrophobic region away from the water. Satisfactory detergency is generally obtained through the use of surface-active compounds which lower the surface or interfacial tension. Detergency generally consists in the removal of particulate matter dispersed in oil or grease and the removal of this soil from fabric is accomplished in the initial stages by the formation of large soapy-soil globules. The displacement of the foreign matter from the fiber by soap solution (wetting action) is further accomplished by jarring and finally dispersement (emulsification) in the aqueous solution. The particles are kept from coalescing by a protective film of an emulsifier. This stabilizing action corresponds very closely with surface activity and is shown by soaps and other polar-nonpolar compounds. Emulsifiers are generally always soluble in the external phase but insoluble in the dispersed liquid; hence, soaps show a detergent effect only when in solution. Foams are similar to emulsions except that gas is dispersed in a liquid, and these are also stabilized by surface-active compounds that depress the surface tension at the gas-liquid interface.

One readily appreciates the heterogeneity of detergent containing wastes when it is realized that several hundred surface-active agents are available in this country. An alphabetical list of detergents available in the United States is given in the *Technical Manual and Year Book of the American Textile Chemists and Colorists*. The chemical nature and purpose for which the detergent is used is also listed. From a treatment point of view, it would be desirable to group the major detergents into categories having similar chemical properties, and the classification by Schwartz and Perry[1] provides such an orderly presentation. Their arrangement is primarily according to the hydrophilic group and secondarily according to the way in which the

hydrophilic and the hydrophobic groups are joined. The tertiary basis for classification is the nature of the hydrophobic group.

Ionic Detergents

The ionic group consists of two main divisions, namely, anionic and cationic. If the low-affinity portion of the molecule in the aqueous solution is included in the anion, the agent is called anionic. Sodium stearate is a typical anionic surface-active agent. The agent ionizes in solution to form Na^+, and the long chain stearate anion, $C_{17}H_{35}COO—$. If the low-affinity portion of the molecule in the aqueous solution is included in the cation, the agent likewise is called cationic. Quaternary ammonium compounds are examples of cationic surface-active agents.

Anionic Detergents: Soap is an anionic detergent and is still the most widely used detergent; however, it has definite limitations. Soaps are unstable in acid solutions, and many of their salts are insoluble. In hard water, which contains calcium and magnesium ions, insoluble soaps are formed by metathesis. The major advantages of soaps are their low cost and high detergent powers. Sodium salts are probably the most widely used soaps. The C_{12} and C_{18} straight-chain, saturated acids and oleic acid, and the C_{18} straight chain, singly unsaturated acid are the most important soap-forming fatty acids. Soaps of fatty acids above C_{20} are unsuitable for detergents, since they are practically insoluble in water at room temperature. Soaps made from other natural carboxy acids, such as those derived from the combination of metallic ions and resins, are useful for washing in sea water. The agents which are half esters of sulfuric acid are commercially important, but the alkane sulfonates are expensive and at present offer little industrial use.

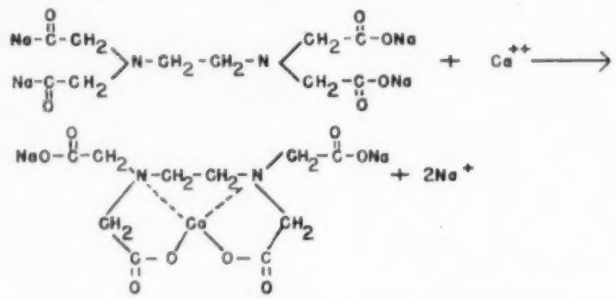
The aromatic sulfonic acids are the most extensively used anionic detergents because they are potentially the most inexpensive anionic surface-active agents which also possess great stability. Another group of detergents (Gardinol, Dreft, Drene, Modinal) are sulfates of long-chain alcohols prepared by hydrogenation of fats. Compounds containing 10 to 14 carbon atoms are most useful and are prepared from coconut, babassu, or palm-kernel oil. These compounds are more resistant to hard water since, unlike soap, they are salts of strong acids and are more stable in solutions of low pH. An excellent non-soapy detergent is Syntex M. It is a sodium salt of the monosulfate of a monoglyceride. Sulfonates of succinic esters show pronounced wetting characteristics, and the solubilizing group is located near the center of the chain. Aerosol OT is a typical member of this class. Another type of detergent introduced into this country which is highly competitive with soap, because it can be produced in quantity and at a price that competes with soap, is the alkyl aryl sodium sulfonates of the type R-Ar SO_3 Na. They (Nacconol, Lanitol, Neomerpin, Santomerse) are produced from petroleum products. Resistance to hard water is attained in another type of detergent, of which the earliest type was the German product Igepon A. In these detergents the carboxyl group was unable to react with metals, but Igepon A was not stable in an alkaline medium owing to hydrolysis at the ester grouping. The defect in Igepon A was corrected by use of an amide linkage —COHN—as in Igepon T.

Cationic Detergents: Another type of detergent is known as an invert soap or a cation-active compound, since the organic part is positively charged, whereas in ordinary soaps the organic part is negatively charged. These invert soaps do not react with heavy-metal ions, which are similarly charged and must be used in neutral or acid solutions. When cationic and anionic surface-active agents are brought together they will mutually precipitate in the aqueous solution. The primary, secondary and tertiary amines are an important cationic group, and these are soluble in acidic solutions where the pH is low enough to convert the bases to their conjugate soluble cations. The quaternary ammonium compounds are soluble in basic as well as acidic solutions. Quaternary ammonium compounds that contain a normal aliphatic chain in the range of twelve to eighteen carbon atoms have bactericidal properties.

Nonionic Detergents: The problem of precipitation of insoluble soaps in hard water is solved by the use of nonionizing hydrophyllic groups. The nonionic surface-active agents are generally considered to include only those compounds which are soluble in water. The best nonionic detergents are usually made by reacting a hydrophobic hydroxy compound, either a phenol or an alcohol, with several moles of ethylene, or propylene oxide. These nonionic polyethers are not affected by changes in pH and are completely stable in hard water, salt water and solutions containing hydrolytic agents. Substances of the ester type made from glycol esters of fatty acids are not particularly good detergents but are classified as useful wetting agents.

Miscellaneous Detergents: The ampholytic and water-insoluble surface-active and emulsifying agents have not yet achieved any unusually great commercial importance and have no unusual properties.

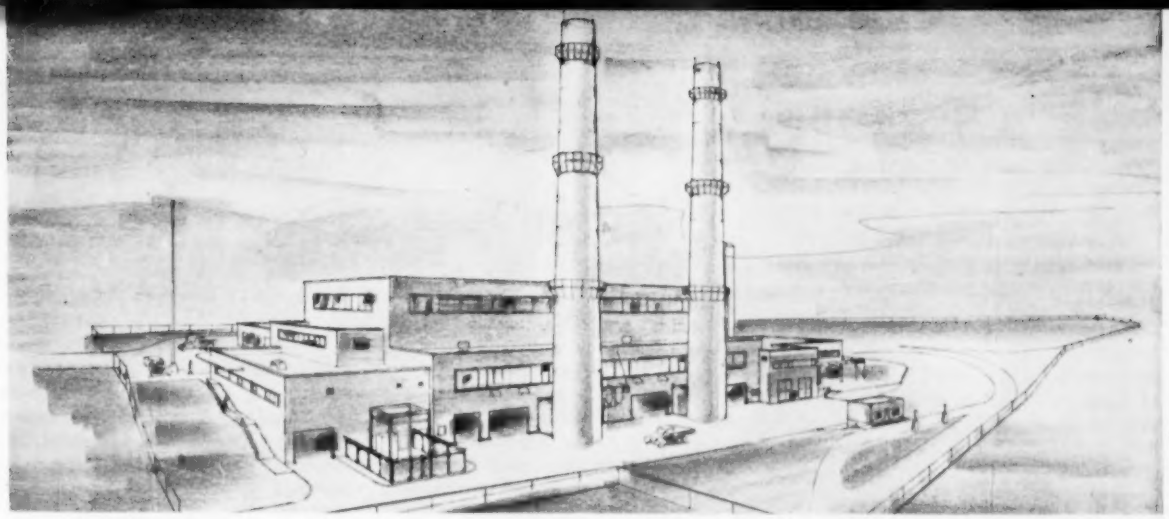
VERSENE + METAL IONS ⟶ METAL VERSENE COMPLEX + SODIUM IONS



Builders in Detergents

Many detergents contain soil removal aids called builders. Sand, alkaline agents and inert fillers are added for scouring detergents; cresol or other antiseptics for medicated detergents; sodium resinate to laundry detergents; and citric or lactic acid as organic builders because of their peptizing properties. The alkaline builders may include washing soda, borax, sodium silicate, trisodium phosphate, various additional complex phosphates and sometimes a fluorescent dye to whiten clothes. More recent products designed for heavy laundry work contain about 25 percent ac-

(*Continued on page* 118)



● ARTIST'S sketch of new Baltimore incinerator which has a capacity of 800 tons of mixed refuse per 24 hours.

Modern Design
FEATURES NEW INCINERATOR

W P. FANNON,
Bureau of Sanitation
Baltimore, Md.

WITH a design capacity of 800 tons of mixed trash and garbage per 24 hours, Baltimore's new No. 4 refuse incinerator will be equipped with hydraulically operated stoking grates similar to those recently installed in the No. 3 Incinerator on Reedbird Avenue. From experience gained with these grates at the present plant, it is anticipated that the new plant will be capable of burning even more than the 800 ton per day design capacity. The new plant will more than double the City's incinerator capacity and will make it possible to eliminate the present sanitary landfill operation. It will be located at 6709 Pulaski Highway, the site of the old No. 2 incinerator.

The building will consist of a 3-story incinerator building with two 2-story wings containing offices, shower and locker rooms and toilet facilities. The west wing, nearest the Pulaski Highway, will be occupied by the operating personnel of the Incinerator Division. This wing will provide facilities for approximately 75 men including the Superintendent and Foremen on the upper level; there will be storage space for maintenance materials and supplies on the lower level.

The east wing will provide similar facilities for about 418 men of the Collection Division. The truck scale will be located at this end of the building and consequently the Scale Room, while a part of the operating facilities, will be included in the Collection Division wing. Other than this the building is so arranged that the two groups occupy entirely separate areas.

The building contract, for which bids were received last May, includes the structure together with heating, lighting and plumbing facilities, parking areas, truck servicing equipment and landscaping. Previously, a contract was awarded for the furnishing and installing of the furnaces together with two 170-foot chimneys and other appurtenances. Bids were received for this contract in March, 1953. The building is designed to house the furnaces and equipment furnished under this initial contract.

The successful bidder for the furnaces and equipment was the Pittsburgh Des Moines Steel Co., who erected the furnaces for the present Reedbird Avenue plant. The successful bidder on the building contract is the Costanza Construction Co., of Baltimore, who have built a number of other city structures.

The building will be of brick masonry construction with steel framing on concrete piles. The building is designed essentially as an industrial plant although there will be some cut stone trim and two basic brick colors will be used to improve the appearance. Since garbage fumes are corrosive to exposed steel and create a maintenance problem, all doors, window frames, and similar fixtures will be of aluminum.

Design Data

An independent oil fired heating system is included in the new building. Consideration was given to the reclamation of heat generated in burning refuse. However, these studies showed that the cost of the special equipment required and the short anticipated life of boilers operating on the hot refuse gases make it more economical to waste that heat and use independent oil-fired facilities for heating the building.

An unusual feature of the design of this plant is the inclusion of a central vacuum system for general house cleaning, as well as for cleaning the flues and combustion spaces. The present plant on Reedbird Avenue is shut down one day each week and the flues and combustion spaces are cleaned by men going into these very hot areas with shovels and wheelbarrows. Even with the plant down for 24 hours the temperatures are so high that men can work for only a few minutes. In the new plant the vacuum cleaning system will replace the shovels and wheelbarrows and almost all the work can be done without men actually entering the combustion chambers. This opera-

tion has been carried on only in pilot plants prior to this time but several incinerators now under construction will have this new feature.

As in the case at the Reedbird Avenue plant, the new plant will include facilities for disposing of small dead animals. This has been quite a problem because rendering plants and other commercial establishments have not been interested in disposing of small animals even though they are anxious to have carcasses of larger animals. The facilities are included in the design although, at present, a contract is in force whereby a local rendering plant disposes of all animals.

The twin 170-foot chimneys will be erected by the Custodis Construction Company of New York, who built the 350 foot chimney, at the Sludge Drying Plant of the Back River Sewage Treatment Works. Like the stack at Black River the new chimneys will be built of alternate bands of red and white brick and will be provided with aircraft obstruction lights in accordance with requirements of the Civil Aeronautics Authority.

Facilities will be available for fueling and washing the Collection Division trucks. Approximately 50 trucks may be stored at the site of the new plant. The storage of other trucks and all truck maintenance work will be carried on at other locations.

Ventilation of the ash removal floor at the present Reedbird Avenue plant has been quite a problem. In order to remove this problem at the new plant the ash removal floor will be entirely open along one side so that trucks will be able to enter from the side of the building and the fans used for forced draft through the incinerator will suck the air from the ash floor and blow the smoke and fumes back through the furnaces. The furnace volumes, the arrangement of the combustion areas and the velocities in the various passages are so designed that no problem of fly ash or stack odors are anticipated.

Plans and specifications for the building were prepared by Whitman, Requardt and Associates, Engineers, with Lucius R. White, Jr., Consulting Architect, both of Baltimore. Plans and specifications for the incinerator equipment were prepared by the Bureau of Building Construction for the Bureau of Sanitation, with Whitman, Requardt and Associates acting as Consultants. The new plant is expected to be ready for operation next spring or summer.

BY-PASS LINE SUPPLIES
Needed Extra Water

H. W. AUGENSTEIN, Sup't. of Water Works, Hamilton, Ohio

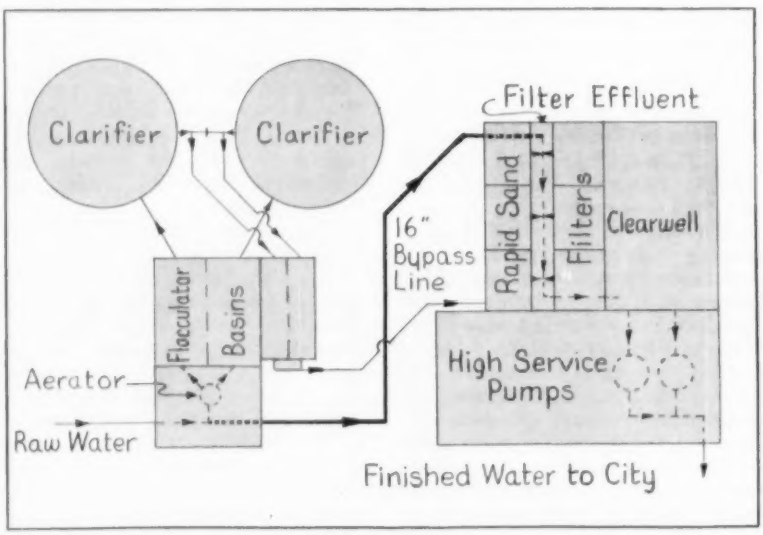
THE demand for water in Hamilton became so great during the summer of 1952, that it was impossible to supply this demand with a satisfactory stable soft water supply. The only possible way to meet the demand was to abandon softening entirely and increase the filter rates sufficiently to accommodate the additional volume of water required to meet this demand. This procedure was followed during a part of July and August. The only treatment administered to the water during this period was aeration, which oxidized some of the iron in the water; filtration, which removed the oxidized iron and other suspended material; and chlorination. Fluorides were also added to the water supply as before.

On June 30, 1953, we completed the installation of a 16-in. by-pass line connecting the 24-in. incoming raw water in the chemical building with the filter effluent flume in the filter pipe gallery. The connection to the flume was made at the extreme end opposite the opening to the clear well, thus permitting the blending of the raw water with the softened water from the filters as the water passes through the flume to the clear well.

The by-pass line was placed in operation on July 1, 1953 and has served its purpose well. The purpose of the by-pass was to permit softening at the designed plant rate and blending sufficient raw water with the softened water to meet the demand. Our policy has been not to exceed a softening rate of 6.5 mgd supplementing any additional demand with raw water through the by-pass. The amount of by-passed water has reached a peak of 3.0 mgd both this summer and last summer.

The hardness of our raw water supply will average from 20 to 22 grains per gallon. We normally soften the water to 5 gpg. The greatest hardness of the finished water during peak by-pass operation was 11.5 gpg. We add 5.0 ppm Calgon to the raw water before mixing with the softened water for stabilization.

The by-pass method of operation was not meant to continue indefinitely, but as an emergency procedure until our new softening plant can be placed in operation. Construction of our new 6.0 mgd plant began in April 1954, and should be completed by January 1956. The plant was designed by Alfred LeFeber and Associates of Cincinnati, Ohio and is being constructed by Charles H. Shook, Inc., Dayton, Ohio.



● **FLOW DIAGRAM of the Hamilton water plant showing the 16-inch bypass line.**

● PLACING and compacting operations at San Antonio sanitary fill. Waste is packed in 2-ft. layers, then covered with 6 ins. of dirt. Overall cover is 30 ins.

● PART OF the fleet of Pakmor trucks. Some of these are 10 yards capacity, but most of them are in the 12 and 15-yard sizes. Refuse volume is 200,000 tons/yr.

ORGANIZATION FOR REFUSE DISPOSAL in SAN ANTONIO

GUY BROWNING ARTHUR

SO well does the State of Texas think of San Antonio's refuse disposal that it is planning to make movies of the operation; and possibly set up a school of some kind, to exhibit the system to other cities. E. M. Marceau had charge of the Garbage Division before he became Director of Public Works last fall, and the refuse system was developed under his direction. He is proud of its performance, with good reason.

In this city of nearly 500,000 inhabitants, covering 80 square miles, with 1500 miles of streets and alleys, none of these general figures present an adequate picture of the size of the job. Nearly 200,000 tons of rubbish are hauled off the streets and alleys in a year. This averages 120 tons per mile of street, and about two tons per family. This is thought to be more than for most cities of this size.

The work is organized to cover 32 routes. These are manned by 160 men working in teams of five each, using two trucks for each team with their drivers, and three men for loading. This is effective, for the hauls are averaging 5 miles to the dumps, making a round trip of 10 miles for each truck. While one truck is going to the dump the men are loading the other truck.

Besides these teams there are two trucks, each with a driver and helper, for dead animals, and two other trucks manned in the same way for brush. Dead animals are buried properly in the ground in dumps, and not under rubbish.

For all of the city except the downtown business area each team has its route, for which it is fully responsible. The crew can leave the yard when it has finished its route and turned the truck in for servicing. During most of the year this relieves the teams in the afternoon. Some get away very early. It is assumed that this early leaving part of the time is in fair balance with the later leaving made necessary during particular seasons, and the teams accept this generality.

But there are some peculiarities which make the work stretch out far beyond the early leaving that occurs when the accumulation of rubbish is light. One is that the amount of rubbish becomes much greater during the summer. Even with longer days some teams work until sundown before their routes are finished. No one has a good explanation of this staggering increase in the hot season, but it cannot be ignored.

Large Holiday Volumes

Another is the tremendous load which is dumped on the Garbage Division during holiday seasons, and particularly through December and January. Art Bennack, who succeeded E. M. Merceau as Waste Disposal Superintendent, talks about this by-product of the glamorous holidays with deep feeling. His concern is for his teams, for it seems that when everybody else is taking time off and making preparations for a glorious fiesta, his men work harder and harder, through longer and longer hours, picking up the tinsel and gaudy wrappings, and later the sad looking discarded Christmas trees.

As this overload increases, a bottleneck develops in hauling to the dumps. It takes longer to make the two-way trip than to load the trucks. This, appearing at present only in the heavily loaded seasons, predicts an end-point which will some time be reached in the use of sanitary fills.

The downtown business area is cleaned at night, using four trucks and crews, but these are not organized as rigidly as the day crews, in order to emphasize flexibility geared to conditions which may be encountered. All the rubbish collected at night is hauled to the incinerator. The trucks make 4 to 6 trips each night, hauling a daily total of about 260 cubic yards. The incinerator is used only for this purpose.

In normal loading during the day the trucks average 3 to 4 trips to the dumps, carrying a total of about 4000 cubic yards of rubbish. During the winter holiday season this increases to 6 or more trips, meaning that each truck travels more than

60 miles a day, besides standing still for longer or shorter periods for loading. The time required for spreading the loads in the dumps is negligible.

The rubbish is sorted carefully. Only material is loaded which will compact well in the dumps, and which will not cause a nuisance. No spoiled or discarded vegetable matter is accepted. No ashes are hauled because they corrode everything they touch, and are a prime cause of expensive maintenance for trucks and accessory equipment.

No so-called "commercial" waste is hauled by the city. Each commercial establishment hauls its own waste, and to particular sections of the dumps. These concerns take care of their waste fruit and vegetables, and also unusual quantities of boxes, paper, cartons, and other matter peculiar to their businesses. Industrial firms do the same, thus relieving the city of hauling many kinds of waste which could not be handled in this streamlined and efficient system.

If the management of the dumps were not carefully integrated with the street operations the system could not be efficient, and would come into disfavor. The city does not own the five dumps which it uses at present, and has no leases. Because the dumps are well managed the city has no trouble in finding ground for the purpose, though it has to go farther and farther out of town for new places.

Owners of depressions and eroded areas, which they would like to develop for recreation grounds and residential building, open them to the city, and invite the city to use them. This could not prevail if the dumping were only casual in method.

Operations at the Fill

The practice is to spread rubbish in a three-track width, which is about 30 feet. The trucks back into place as directed, and dump their loads progressively in the band which has been laid out. Immediately after a truck pulls out, heavy Allis-Chalmers or International bulldozers, with some front-end loaders, push the material into place, and then run back and forth over it until it is compacted. The operation, which one might expect to be haphazard and uninteresting, becomes fascinating to watch. The rapid dumping of incoming trucks and the quick follow-through of the compacting is confusing unless each single dumping and compacting of the individual load is watched closely.

There is no interruption or delay, and a full day's run of material is packed down in an ordered succession of operations until a new section of the dump, the 30-foot track, is ready for covering.

A salvage company has a concession from the city permitting it to pick out anything it can use. This sorting has to be done very quickly, before the material is pushed into place by the bulldozers, and not much of value is recovered. Mexicans, both men and women, work on the dumps for the salvage company. With their flair for the dramatic they have coined a name for themselves based on "tromping" down on the rubbish. They call themselves "Trompero," for which an entirely different definition will be found in a Spanish dictionary. But it dignifies their work, and that pleases them.

Each new layer of material is about two feet thick when fully packed. Over this 6 inches of dirt is spread. Two more feet of rubbish is placed on this, and the layering proceeds until the three-track width is brought high enough for its overall covering. This final layer of dirt is 2½ feet thick, spread evenly and uniformly, leaving a surface which suggests nothing unusual underneath.

The subsequent use of such a dump depends on what material is used and how it is packed. In San Antonio the selection of material is severely discriminating. Most of it is paper, cans, rags, and other material which does not decay. All of it has been crushed flat in the trucks and in compacting in the dump. In a place where the rainfall is light, as in San Antonio, there is not enough moisture to swell the material and expand its bulk.

Handling of the waste of "commercials" is different. They dump their material in sections of the dumps apart from the city's operations. They are permitted to burn their piles, and seem to be glad to comply with all regulations. When the piles have burned down the city bulldozes the residue into place in "tracks" and covers it with dirt.

An unfortunate cause of irritation is the carelessness with which the commercials haul their stuff to the dumps. The city's trucks are closed, so there is no chance of dropping off miscellaneous refuse along the way. When Christmas trees and boxes litter the roads to the dumps the complaints are always to the Garbage Division, and it has to explain that its trucks are shut and locked. But the public still wonders how to account for the unsightly paper, boxes, trees and scraps which adorn the shoulders of the roads, at times, in spite of all the care exercised by the city.

For its hauling the city has adopted the Pak-Mor body, which is made in San Antonio in 10, 12, and 15-cubic yard sizes. It has proved to be an efficient body for packing quantities of loose rubbish into trucks in such volume as to make long hauls to the dumps practicable. The 12-cu. yd. body costs something over $3000, and the 15-cu. yd. size about $3400. One advantage claimed in explaining for this body is that it is extremely simple in construction, so repairs and maintenance are easier in a city organization soundly concerned with economy in all operations.

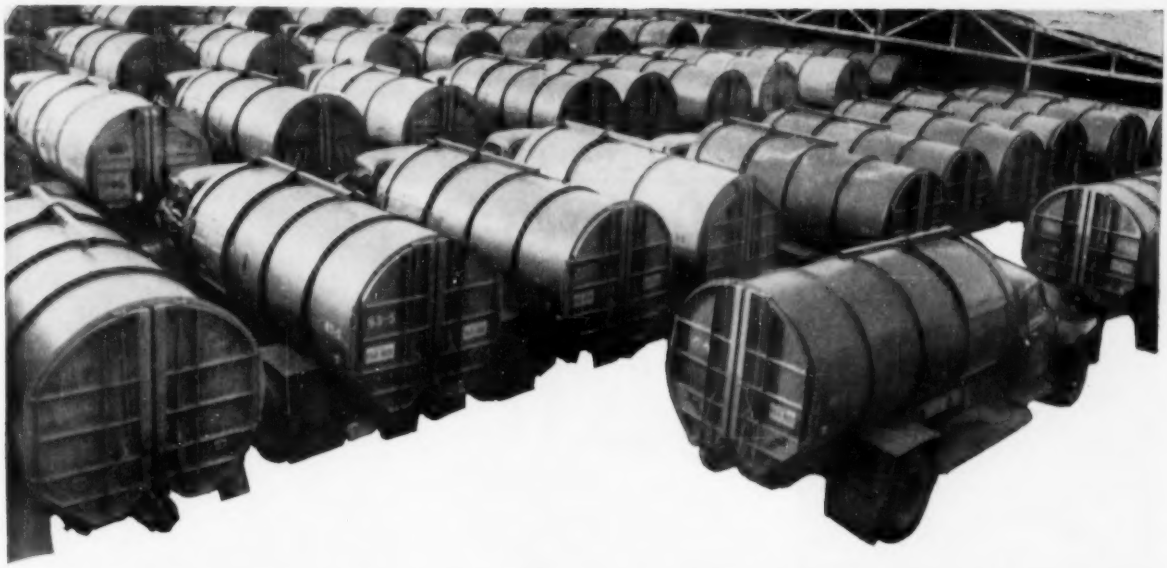
Certain limitations haunt such a system, here and elsewhere. Just how long will a rapidly growing city be able to find suitable ground for dumps? If they can be found, farther and farther out of town, how long will the hauling of garbage to them be economical? Mr. Marceau and Mr. Bennack bring out these points frankly in discussing the present system. It is evident that the use of sanitary fills for rubbish must be worked out with some equation of city-growth and distance that will fit the situation.

For the present the problem is solved satisfactorily. An unusually high tonnage of rubbish is packed solidly into waste places and covered so as to reclaim these places for better uses. Stagnant water is eliminated. Thus mosquitos are deprived of breeding places. What were once desolate areas become playgrounds, eventually home sites, and perhaps subdivisions. So good housekeeping in the city pyramids into a service which cannot be measured by anything San Antonio can see today.

• • •

Motor Vehicle Use in 1953

According to the Bureau of Public Roads the total registration of motor vehicles in 1953 was 56,279,864, an increase of more than 3 million over 1952. Of the 1953 total 46,460,094 were passenger cars, 9,575,519 were trucks and 244,251 were buses. The Bureau estimated motor vehicle travel in 1953 at 540 billion vehicle miles, a gain of 5.5 percent.



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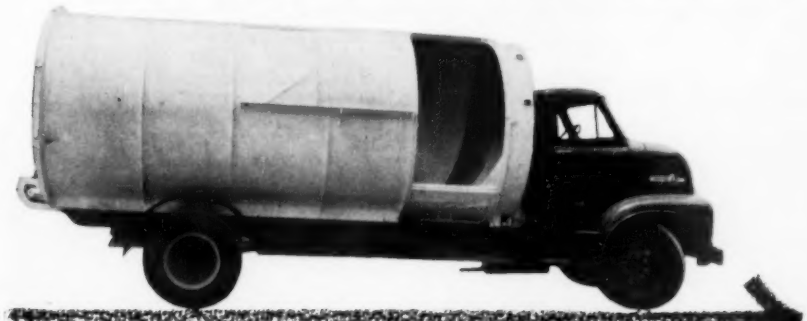

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APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
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First APWA Chapter Formed in Canada

New Manitoba Chapter Makes APWA an International Association

E. A. Wood, Supt. of Street Cleaning and Refuse Disposal of Winnipeg, was elected President of the new Manitoba Chapter of the APWA at its inaugural meeting in Winnipeg. Mr. Wood became a member of the International Association of Street Sanitation Officials—a predecessor organization of the APWA, in 1927.

Warren A. Coolidge, Director of Public Works, Nashville, Tennessee, and newly elected President of the APWA was guest speaker at this meeting. Other members elected to office were: J. Scaife, Engineer of the Municipality of St. James, First Vice-President; and C. A. Keeping, Engineer of Roads and Streets, Winnipeg, Manitoba, Secretary-Treasurer. The following members were also elected to serve on the Executive Committee: M. Jeroff, Municipal Engineer, West Kildonan, Manitoba; George Durnin, City Engineer, Brandon, Manitoba; W. Walterson, Foreman, Department of Public Works, Selkirk, Manitoba; and E. Simpson, Engineer of Inspections, Winnipeg, Manitoba.

W. D. Hurst, City Engineer of Winnipeg and newly elected member of the APWA Board of Directors was instrumental in organizing this new Canadian Chapter. Special guests present at the meeting included Mayor S. Oliver of Selkirk and Alderman J. G. Harvey, Chairman of Winnipeg's Public Works Committee. An excellent precedent was set by G. Laidlow of the National Testing Laboratories, who presented a very informative paper on the various types and uses of asphalts.

APWA Releases New Specifications for Sidewalks And Curbs

A revised edition of the APWA Standard Specifications for the construction of sidewalks and curbs has just been published and is now available for general distribution. The new specifications cover concrete sidewalks, curb, curb-and-gutter and stone curb, and are all included in a 20 page bound booklet which is priced at $1.00 per copy to non-members. (10% discount if payment accompanies order). Two standard curb sections, and eight standard curb-and-gutter sections, with variable depths and three standard widths are included in this publication. The Committee that prepared the 1954 edition of these specifications was headed by George Snyder, City Engineer, Jackson, Michigan. Others on the committee were: J. B. Lambeth, Chief Engineer, Raleigh, North Carolina; L. K. White, City Engineer, Wichita, Kansas; L. C. Whitsit, Highland Park, Michigan and George S. Bisso, Head Engineering Division, New Orleans, Louisiana.

Texas Chapter Holds Annual Meeting

Public Works Officials of the Lone Star State met in Fort Worth, for their eighth annual meeting of the Texas Chapter of the American Public Works Association. The meeting, as usual, was held in conjunction with the 1954 Convention of the League of Texas Municipalities. W. O. Jones, City Manager of Fort Worth and Past President of the APWA welcomed all members of the Chapter to the host city at the opening session.

The Greater Fort Worth International Airport was the subject of an interesting discussion by Ira C. Driver, Chief Engineer and W. A. Satterwhite, Office Engineer, of that city's Department of Public Works. F. E. Lovett, Expressway Engineer of the Texas State Highway Department told the Chapter about the Freeway System In Fort Worth, and James C. Dingwall, Engineer-Manager, Texas Turnpike Authority discussed plans for the Dallas-Fort Worth Turnpike. The diversified program also included a talk on Garbage and Sanitation by G. C. Brinkley, Superintendent, Sanitation Division, Dallas, and a panel discussion on Land Subdivision and Annexation Problems.

Action taken at the business session resulted in the election of J. R. Hennon, Superintendent of Water, Sewer and Public Works of Port Neches, to the Presidency of the Chapter to succeed

(*Continued on page* 94)

President
Warren A. Coolidge

Vice-Presidents
Edward P. Decher W. M. Swietlik
Kenneth K. King Albert G. Wyler

Past President
Milton Offner

Directors
Frederick W. Crane Roy W. McLeese
Raymond A. Williams W. D. Hurst

Treasurer
Robert L. Anderson

Executive Director
Donald F. Herrick

Members Present at Annual Meeting of Iowa Chapter

Members of the Iowa Chapter of the American Public Works Association present at their second annual meeting, held at Waterloo, Iowa. The Chapter announces that it will hold a meeting in the Spring in conjunction with L. O. Stewart's Annual Short Course at Iowa State College, Ames, and a Fall meeting at Cedar Rapids.

Wisconsin Group Hears Highway Commission Chairman

New Slate of Officers Elected at Annual Chapter Meeting

Nearly fifty members and guests attended the annual meeting of the Wisconsin Chapter held at Neenah, Wisconsin. Wayne G. Bryan, Director of Public Works of the host city arranged a very enjoyable meeting which featured a talk by Harold Plummer, Chairman of the Wisconsin Highway Commission.

The Chapter officially approved a report on public works reporting, which was prepared by one of its committees headed by John E. Dever, City Manager of Two Rivers, Wisconsin. This document will soon be published by the American Public Works Association. Other action taken at the meeting was the election of a new slate of officers.

Carl A. Wahlstrom, Supt. of Public Works, LaCrosse, was elected President to succeed Peter Burbach, City Engineer, West Allis. Wayne G. Bryan, Director of Public Works, Neenah was elected Vice-President and John G. Thompson, City Engineer, Madison was re-elected Secretary-Treasurer. Other members named to the Executive Committee were: R. E. Fleischer, Director of Public Works, Sheboygan; E. L. Knebes, Assistant City Engineer, Milwaukee; Robert J. Poss, Director of Public Works, Marinette; and H. B. Wildschut, Director of Public Works, Wauwatosa.

Harold Plummer, center, Chairman of the Wisconsin Highway Comm. chats with Pete Burbach and Wayne Bryan.

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Texas Meeting

(*Continued from page* 93)

City Manager, R. B. Sherrill, Jr. of Lufkin. H. H. Hester, Street Superintendent of Fort Worth, was named Vice-President, while E. C. Drumb, City Engineer of Denison and T. Spencer Love, City Engineer of Southside Place, were elected to serve on the Chapter's Executive Committee. J. P. Burden, City Engineer of San Angelo was re-elected Treasurer and E. E. McAdams, Executive Director of the League of Texas Municipalities, with headquarters in Austin, will continue to serve as ex-officio Secretary of the Chapter.

• • •

Snow Collecting Properties of Snow Fences

Field experiments have confirmed earlier observations by the British Road Research Laboratory that the best snow collecting properties are possessed by fences having a ratio of frontal area of solid material to total frontal area ("area density") of 35 to 50 per cent. The total volume of snow collected by fences of similar density with vertical and horizontal slats was the same but the drifts were 10 to 15 per cent longer with the fence having horizontal slats.

• • •

Requiring Private Parking Space

A zoning ordinance being considered in Pittsburgh would require most buildings of the future to provide their own off-street parking and loading space. This code, which has been in preparation for several years, establishes certain minimum requirements, such as providing one parking stall for every 260 square feet of floor area over 2400 for retail businesses, and one stall for every five industrial employees on the daylight shift.

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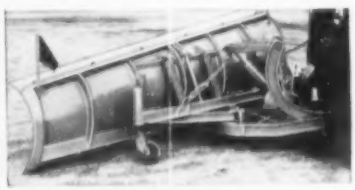

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Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

A PROGRAM has been established to replace the old Reconstruction Finance Corporation program under which municipal bonds were purchased to finance public works programs in towns and villages that could not sell their bonds at a reasonable rate of interest. The RFC loaned money principally for water and sewer systems, transportation facilities, hospitals, irrigation and drainage facilities, bridges and tunnels, gas lines and other public utilities.

The new program is set up in the Community Facilities Division of HHFA. It authorizes loans to municipalities which "cannot secure adequate financing elsewhere." A municipality gets into the program by securing from the nearest HHFA regional office a copy of the Information for Applicants form (H984-A). If preliminary responses indicate that the community qualifies it should secure and fill out the Application Form (H-984).

Administrative regulations prescribe 4¼ percent as the interest "break-off" point. If a town or village cannot sell its bonds for less than that amount, then HHFA will consider buying them. Applications are now being accepted for this program for which $2 million is available for the current fiscal year.

AMA discussions with top Administration officials indicate that there is a considered desire to use this program principally to help smaller towns which do not have ready access to the bond market, or whose issues are likely to be in such relatively small amounts that they fail to attract interested bidders. Rules and regulations adopted by the agency call for the final advertisement of such bonds by the agency, and if no bidders appear to take the bonds below the 4¼ percent interest rate, direct purchase is possible.

A municipality should make every effort to sell its bonds at a reasonable price before approaching HHFA. Administrative criteria require a municipality to describe, in detail, the procedures undertaken to sell the bonds including the preparation of a prospectus, advertisement, etc.

In effect, the program places a ceiling on the interest rate which small municipalities must pay to finance public improvements. In that respect, it saves millions of dollars for local taxpayers because the "ceiling" is known to the bond buyers and the tendency is to bid for small bond issues against the 4¼ percent interest rate. The program is viewed as particularly helpful to smaller municipalities which contemplate issuance of revenue bonds for public works which are of a proprietary nature.

Typical questions which the applicant must answer are: (1) Demonstrate the contention that "adequate financing is not available" by illustrating which local lending agencies have not shown interest in the issue; (2) if revenue bonds, indicate how the bonds will be paid out of the revenues from the public works facilities; (3) if general obligation bonds, show the sources of local funds; (4) statement regarding the legality of the bond issue and the city's right to engage in that particular public works construction; (5) legal counsel and registered engineer employed by the municipality; (6) additional financial information about the municipality including audit reports, financial statements, statement of bonded debt, etc.

Preferential treatment will be accorded the smaller municipalities in the administration of this program.

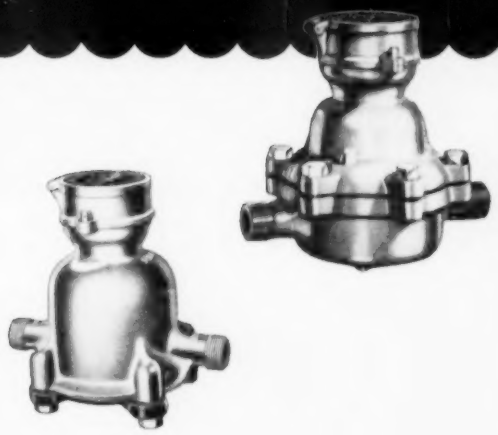
• • •

Motor Vehicle Speeds

According to Highway Research Abstracts the average speed of all motor vehicles in 1953 was 49.7 mph., a record high, but only 0.2 mph. above 1952. The average speeds for cars, trucks and buses were 51.1, 44.9 and 51.5 mph.

Water is vital...

BADGER meters conserve it BETTER!



AMERICA'S steel production now tops 72,000,000 tons annually . . . yet it actually takes more water than iron ore to produce today's steel. Badger meters conserve water for such vital needs . . . measure water usage precisely . . . help eliminate water waste in thousands of communities. They make sure that homes and industrial projects alike receive a fair share of the supply, and pay a fair price for the water used. Thus, Badger meters actually help keep water departments self-supporting for thousands of communities. No wonder waterworks men everywhere praise Badger meters . . . recognize them as the meters that *save water, work and money — all ways.*

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Water Meters

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"Measures the water of the world"

How Should We Control Water Supply and Sewage Disposal in Subdivisions?

M. WARREN COWLES

Health Officer, Hackensack, N. J., Water Company

THERE are three basic types of realty developments where water supply and sewage disposal are of interest to health authorities. These are: Class A—Those where connections to approved public water supplies and approved sanitary systems can be made; Class B—Those having connections to approved public water supplies but with no connection to an approved sanitary sewer system thereby necessitating the construction of individual sewage disposal devices on the same lot; and Class C—Those where there is no connection to either public water supply or public sewer thereby requiring a safe source of water and also an individual sewage disposal system, both of which must be placed on the same lot.

In a group of lots in each of the three classes having similar surface grades, soil characteristics, ground water levels and surface water collection and disposal systems, the lots in Class B will have to be larger than those in Class A; and those in Class C will have to be very much larger than those in Class B. The area required for the individual sewage disposal systems will be the same under these assumed identical conditions for Class B and Class C lots but increase in lot sizes in Class C is due to the necessity for protecting the source of water supply from pollution arising on the same or adjacent lots.

It is essential to realize in Classes B and C that permission for the erection of houses is given in most municipalities by the building inspector and that the building inspector also issues the certificate of occupancy. The responsibility of the building inspector is to see that the building code is carried out. The building inspector is not required to consult with the local board of health with regard to problems of sanitation. It is inevitable, therefore, that, from 50 percent to 80 percent of the sewage disposal installations are inadequate. The building inspector cannot be expected to carry out this responsibility; it is not his job. He may consult the local board of health but, more frequently, the board of health is called in, after the houses have been erected, to meet the problems which have arisen and which must be solved prior to occupancy. The local board of health, in this case, is pressured into solutions not dictated by code requirements and sound judgment but by expediency.

In Classes B and C, the local board of health should and must be consulted before plans for building are approved. The board of health must be convinced, through the submission of adequate information, that proper sanitation can be obtained after the completion of the facilities. Unless there is this full cooperation, the results are likely to be unsatisfactory regardless of the completeness of the local health code or the highest possible efficiency in its administration. This cooperation can best be insured by amending municipal ordinances. Such amended ordinances serve also to avoid expensive and unnecessary reconstruction of facilities or the acceptance of conditions which are not satisfactory but which it is too late to change.

The Ideal Ordinance

The ordinance should amend the building code to provide that no building permits or certificates of occupancy may be issued unless and until the local board of health is satisfied that proper sanitation can be provided.

The basic factors which the local board of health must consider include the following:

1. The character of the soil for-

New York Adds 165 New Trucks to Collection Fleet

● **ONE OF the 165 new refuse collection trucks recently added by New York City.**

WITH the recent purchase of 165 new refuse collection vehicles equipped with continuous loading escalator compacting bodies, another step has been made in the equipment modernization program of New York City's Department of Sanitation. This extensive rehabilitation program has resulted in the purchase of nearly 1400 new units since 1948.

Continued studies, tests and modifications have been made to obtain the best units for the needs of the Nation's largest collection service. The objective is to build up a modern collection fleet which is both reliable and economical to operate. The department has standardized on the escalator compacting type of body for its collection fleet. Roto-Pac units made by City Tank Corp. were furnished for the 165 units purchased in 1954.

Currently the collection fleet numbers some 1600 vehicles. Approximately 1200 trucks operate during the day and 300 at night. The balance are in shops for preventive maintenance or repair. Night operations care for special locations where traffic is extremely heavy during the day and supplement the operations of the day crews in other locations. Another advantage of night operations is the round-the-clock availability of a crew for snow plowing work during winter months.

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Over 60 years service has proved the rugged worth of Blackburn-Smith Ejectors. Yet our today's product has these exclusive modern features:
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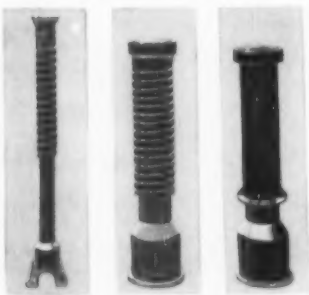

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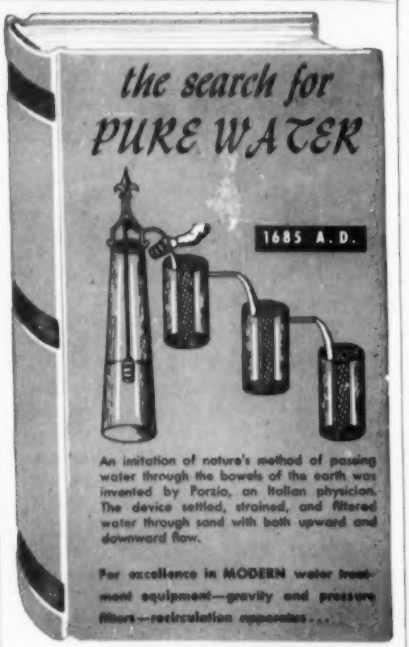
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mation as it is revealed by suitable test holes;

2. The porosity or permeability of the soil as it is determined by percolation tests;

3. The detection of areas of soil unfavorable for absorption purposes;

4. The determination of the maximum elevation of ground water and plans for the reduction of the water level, if necessary, by drains with an acceptable elevation at the point of discharge;

5. Determination of the steepness of slope of original and altered surface grades, both on streets and within the lots, and the necessity for retaining walls or terraces;

6. Limiting distances for the several parts of the sewerage system from the foundation walls, lot lines, walls, terraces, ground water diversion drains, watercourses or sources of water supply;

7. Surface drainage in relation to areas where sewage disposal devices will be installed to avoid consequent interference with their operation;

8. Determining areas where cut or fill will be required and, in filled areas, redetermining the resulting character and compactness of the fill;

9. Locating the dry wells for roof leaders;

10. Planning for the collection of surface water on lots and its discharge through storm drains and into watercourses; and

11. Planning for protection against flooding from existing watercourses during periods of heavy rainfall.

All of these factors are important as they relate directly to the selection of a suitable and adequate area to be reserved for sewage disposal facilities which in turn affect the size, shape and grade of the proposed lots in the development.

Site Plan

The necessary information for board of health consideration should be presented in the form of a "site plan", adapted from V. A. procedure, regardless of the number of lots involved. All basic factors must be included either on the plan or on attached data sheets and areas reserved for sewage disposal installation and their elevations clearly marked. It is then possible to determine in advance the problem areas and secure any desirable changes, or face the situation that certain lots or sections are unbuildable. In Class C developments, the location and type of private wells or other sources of supply, should be shown. The preparation of a site

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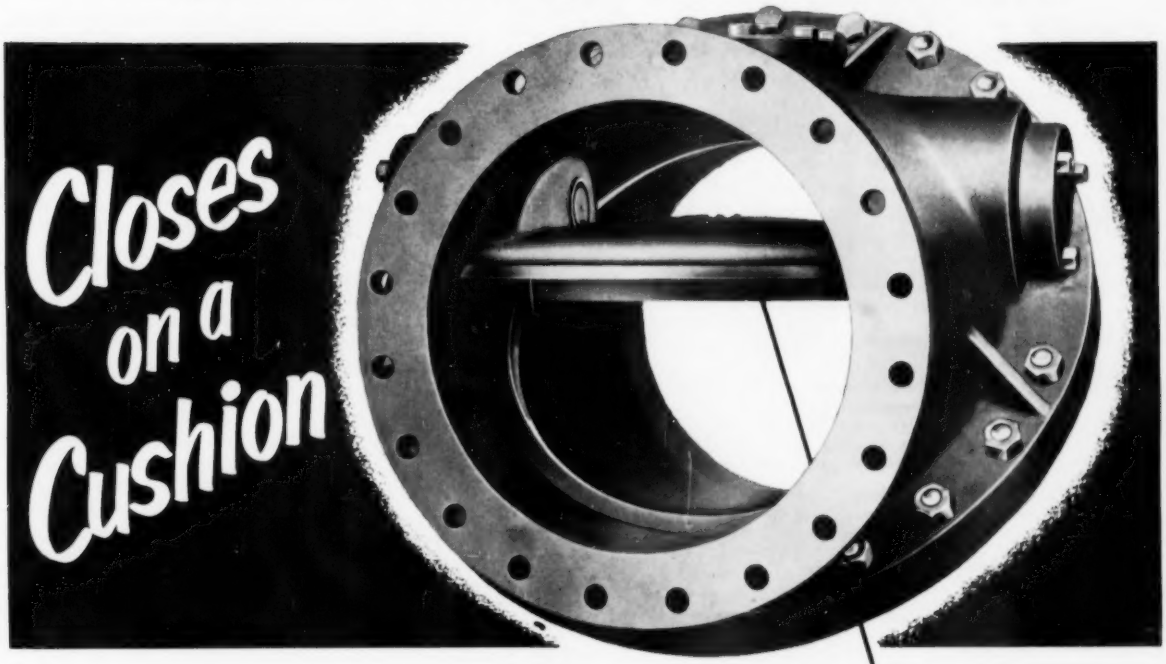
Chapman's Tilting Disc Check Valve

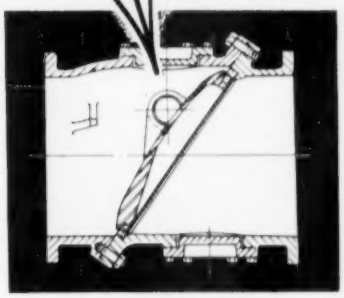


...for low cost, slam-free operation

Balanced pressures *cushion* the movement of the disc in Chapman's Tilting Disc Check Valve. The valve closes quickly but quietly, in all but unusual piping arrangements. There's no slamming to damage pipe-line joints or the valve itself. And *drop-tight* closure eliminates sliding wear on the disc and seat.

In the open position, the "airfoil" designed disc rides firmly against stops, without swinging or fluttering. That's why the hardened extra-large hinge pins give extremely long wear. And the absence of turbulence is one reason why head loss through Chapman's Tilting Disc Check Valve is lower than through any other type of check valve.

Low head loss, increased wear resistance and freedom from destructive slamming make Chapman's Tilting Disc Check Valves unbeatable for almost every installation. Write for Catalog No. 30 today.



Here's why
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The Gentile* FLOW TUBE measures flow in either direction

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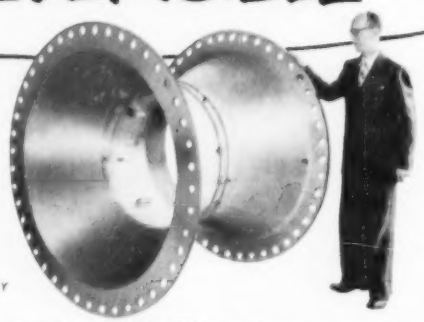

REVERSIBLE . . . The Flow Tube is symmetrical, with upstream and downstream ports identical. When the flow is reversed, the differential is reversed. Permits metering reverse flow at lowest possible equipment cost.

LOW INSTALLED COST . . . Average length is only 1½ times the pipe diameter, and straight runs entering and following are not required unless installed near throttling valves or regulators.

ACCURACY . . . Produces differential from points of equal cross-sectional area . . . furnished with head capacity curves, and guaranteed for exceptional accuracy when used with any standard indicating, recording or integrating meter.

LOWEST HEAD LOSS . . . The Flow Tube can be designed to produce a measurable differential with the lowest permanent pressure loss of any type head meter.

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plan is dependent on proper planning of a subdivision which has not been considered until recently a function of the local health agency.

If the basic information is properly obtained and a proper site plan based on this information is drawn, the board of health can be reasonably sure that serious sanitation problems by reason of unanticipated conditions will not occur on more than, say 5 percent to 10 percent of the lots contained in the development.

Assuming now for Classes B and C developments that we have an acceptable site plan and an approved subdivision plan accepted by the planning board (or the governing body), what other steps are important?

1. The actual design and location of the sewage disposal system for each lot; the filing of an acceptable detailed plan including elevations; and inspection of the premises.

2. Inspection during (a) street grading, storm drain construction and cellar excavations to check type of soil on completion of rough grading; (b) installation of individual sewage disposal systems and (c) alteration of the location and elevation of such systems if adverse conditions are detected. Inspections after rough grading has been completed are usually included in health codes but supervision during initial street grading and excavation for storm drains or cellar is equally necessary.

3. The requirement of some form of guarantee for the satisfactory operation of the sewage disposal systems for a period of at least one year after occupancy, such guarantee to be in a form acceptable to the local health agency or to the municipality or to both. In some cases, bonds will have to be posted with the local board of health; and in other cases, what is essentially a bonding provision for improvement of streets, curbs and the like, may be extended by municipalities to also include surface grading and disposal systems.

These three important items must be adequately covered in a detailed code for sewage disposal systems which, in turn, must spell out all the requirements implied in the basic factors already briefly enumerated. The site plan and the approved subdivision plan should be prepared with the knowledge of the code requirements so that the board of health will not be called upon to vary the code requirements except for unusual con-

ditions not anticipated in the basic studies, and not for failure to observe the code requirements. Obviously, changes can be made in the site plan by amendment where subsequent information justifies the change.

For water supplies in Class C developments, the approach is somewhat different. A knowledge of the geological formations is essential to determine whether a location planned for a private well with the type of construction proposed will be such that the water from it will be unaffected by contamination or pollution from the same or adjacent premises. For rock wells or gravel wells, a thick layer of clay, more or less continuous, will be effective against contamination.

Wells should be adjacent on adjacent lots and sewage disposal systems likewise adjacent but at opposite corners of the lots. Limiting distances between wells and sewerage systems should be at least 50 feet but 100 feet is better. In limestone formations, pollution may travel for very long distances.

This material is condensed from a paper presented by Mr. Cowles at the conference of New Jersey State and Local Health Officials.

• • •

Testing Meters

(*Continued from page 79*)

the upper electrode, the electrical circuit is broken causing the test control index hand to stop instantly and thus indicate the exact registration.

(3) The accuracy test of the meter having been completed, the operator slowly closes the control valve to the meter test bench, retarding the rate of flow in a manner not to create any water hammer, until the rate of flow becomes zero and before the water overflows the top of the tank.

Concisely stated, the procedure is: a—Reaching the desired rate of flow, without creating any water hammer. b—Making the actual test with electrical energy, accurately and without human errors. c—Shutting off water slowly without creating any water hammer.

Another prime factor with this tester is said to be speed of testing. It will test one, or a parallel battery, or a series of meters simultaneously. Furthermore, it will make the complete accuracy or registration test with one unit of water. By this is meant that the index hand of the meter need not pass ten units of liquid in order to cause the test index hand to make ten full revolutions. With the specially designed dial the test results can be read to 0.25 percent with only one unit of liquid passing through the test meter. This tester thus gives both accuracy and speed.

Though the photo shows only one meter being tested, this unit is adapted to testing any number of meters simultaneously merely by adding, for each additional meter or register to be tested, a register assembly. This feature is particularly valuable for testing large meters (of the compound type) which have two or more registers. Heretofore this procedure has not been possible without some estimation and interpretation to determine the register readings accurately. This tester determines such readings with an accuracy well within 0.25 percent, without interpolation, from the large dial. Additional meters may be of various sizes, compound meters with two or more registers in series, or parallel batteries. These can be run in the same test because there is no variation in the rate of flow during actual test.

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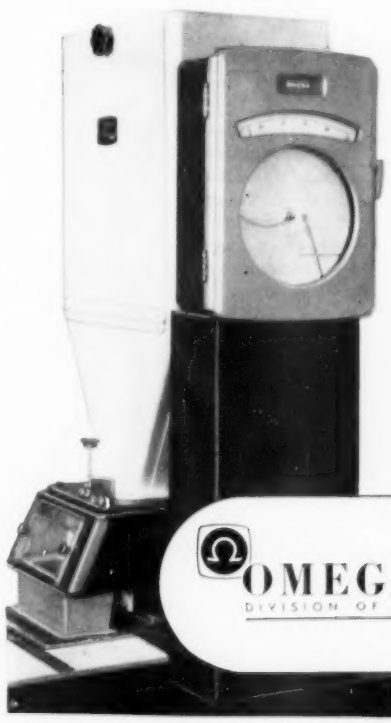
The Omega Model 50A Volumetric Fluoridizer with the new Omega Loss-in-Weight Continuous Indicator-Recorder provides double safety for your fluoridation program. The Feeder itself is your guarantee of high volumetric feeding accuracy. The Continuous Indicator-Recorder double checks the weight of chemical fed. It shows at a glance —



- √√when the hopper was loaded
- √√the amount of fluoride chemical loaded
- √√the weight of chemical remaining in the hopper
- √√a continuous and permanent chart record of feeder operation

This Loss-in-Weight Indicator-Recorder is another of the many Omega contributions to safe fluoridation. For complete details on Omega fluoridation equipment, write for Bulletins 50-K3, 30-H21, and 50-L13. Omega Machine Company, 356 Harris Ave., Providence 1, Rhode Island.

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PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Measuring Rainfall by Radar

Since 1948 the Illinois Water Survey has been developing practicable methods of using radar for quantitative measurement of summertime precipitation. First, special networks of rain gages were established to define the accuracy of this method at various gage densities and to check it against radar measurements of rainfall. Data obtained from 50 recording rain gages distributed over an area of 96 sq. mi. showed that, during a given storm, the fall at some gages may be 10 times or more that at others; and that calculations for 45 storms based on any one gage averaged an error 6 times that obtained when 24 gages were used.

In the radar apparatus used, a narrow beam of energy is focused by a rotating antenna, much like a searchlight, and a small part of this is reflected back as an "echo" when it strikes a group of raindrops, and is amplified and presented on a cathode ray tube, from which the range and bearing of the rain can be determined. These "echoes" are photographed on 35 mm film. The technique and apparatus are quite complicated; and the results are translated into amount of rainfall by equations developed by comparisons with gage data. It is believed that radar rainfall measurements can be used to supplement thunderstorm rainfall sampling by the rain gage network, since radar scans an entire area, including portions of it in which there are no rain gages.

"Quantitative Measurement of Rainfall by Radar". By A. M. Buswell, G. E. Stout and J. C. Neill, Meteorologists, State Water Survey, *Journal, AWW Assn.*, September.

Snow Surveys In California

In California practically no rain falls through June to September, and water used during that period comes chiefly from the melting of snow which fell in the mountains the previous winter. The amount of snow fall therefore is of great interest to practically all citizens, since knowledge of it makes it possible to forecast the water supply which will be available for irrigation, power plants and other purposes. In 1918 the state began making snow surveys, measuring the depth of snow and its water content at numerous selected points. Comparison of these data with the runoff the following summer, year after year, has resulted in the development of a water supply forecasting technique for each of the 13 major watersheds whose runoff is forecast by the Division of Water Resources. The relations between snow depth and summer runoff vary with the different characteristics of the watersheds. Forecasts are published during the first few days of February, March, April and May. There have been recent improvements in measuring the water content of a snowpack. One is to establish storage gages capable of retaining the entire precipitation of a season. Another is to place a radioactive material on the ground; then the impulse directed to a Geiger-Muller tube placed vertically above it will be diminished by the water content of the snow blanket, by amounts which have been determined. Each year, use of the accumulated data of previous years adds to the accuracy of these forecasts.

"Forecasting Water Supply Through Snow Surveys". By Fred A. Strauss, Sr. Hyd. Engr., Div of Water Resources. *Journal, AWW Assn.*, September.

Automatic Control of Water Levels and Pressures

Carroll, Ia., obtains its water supply from four wells, pumped into a 50,000 gal. reservoir; and from this, by three high-service pumps, to a 500,000 gal. elevated tank 2 miles distant. The level of water in the small reservoir and that in the elevated tank are controlled automatically by equipment furnished by the Automatic Control Co. A receiver-transmitter at the main pumping station receives signals when the water in the elevated tank falls below a certain level and starts a high-level pump, and a second and third pump if necessary. If the water in the reservoir falls too low, the central transmitter starts one, two, three or four of the deep-well pumps, as many as may be necessary. If these cannot keep the reservoir above a safe minimum, the high-service pumps are stopped and locked. If any deep-well pump fails to discharge water after being started, the pump is stopped automatically and a light and sound warning signal sent to the main station. Should the pressure on the distribution system drop, a warning is sounded at the fire station.

"Automatic Controls Give More Tank Capacity and Better Pressure Stability". *Public Works*, November.

A Recording Evaporation Gage

An evaporation-gage has been designed by the hydraulic laboratory of the Illinois State Water Survey which records loss through evaporation continuously on a chart attached to a drum driven by a clock mechanism and revolving once in a week or in 48 hours. Perhaps the most important advantage of the instrument over a standard evaporation gage is that it will record evaporation or sublimation from an ice surface in wintertime. The instrument utilizes a modification of the weighing bucket type of rain gage, measurement of evaporation being the reverse of the normal method of measuring rainfall. Three of them have been operated in Illinois from February, 1953 to the present time.

Quality control begins with our own sources of raw materials

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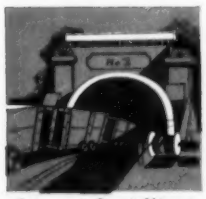

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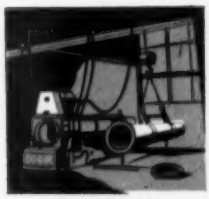

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"Recording Evaporation Gage Provides Year-Round Record", By W. J. Roberts, Assoc. Engr., State Water Survey. *Civil Engineering*, October.

Leakage Tests for Sulphur Compound Joints

In 1951-1953, Roanoke, Va., laid about 23 miles of 12-in. to 6-in. mains of bell-and spigot c.i. pipe, under contract specifications that leakage should not exceed 50 gpd per inch diameter per mile. The City furnished all joint material, including yarn, to the contractor. On testing, a number of sections were found to be leaking in excess of the specifications, but the leakage was decreasing steadily; and, as it was necessary to use the mains at once, they were put into service, but continued to be tested for leakage at intervals. Within three months, in all but one section, the leakage had diminished sufficiently to meet the specifications. In that one section, laid by an unreliable contractor, a number of bad leaks were found and repaired; minor leaks repaired themselves, and the line was satisfactorily tight about a year after it was laid. The author thinks specifications for making such joints should give the contractor a designated time for meeting the leakage requirements; and that the best insurance for perfect joints is to have them made by regular employees, who will have to repair them if they leak.

"Leakage Tests Found Necessary in Main-Laying Contracts". By Carmon E. Hylton and John W. Biggers, Water Dept. *Water Works Engineering*, October.

Fluoridation Of Water Supplies

As of Dec. 31, 1953, more than 840 communities in the United States were using fluoridated water supplies to supply almost 16,000,000 people. (In addition, 631 communities are served by water containing naturally occurring fluoride in concentrations greater than 1.5 ppm). The principal chemicals used are sodium fluoride and silicofluoride. The distribution of fluosilicic acid is usually limited to the locality in which it is produced. The use of ammonium silicofluoride is relatively minor. Sodium fluoride is quoted at $12.50 per 100 lb., fob factory; and sodium silicofluoride at $7.00; both in carload and truckload lots; more in small quantities. Fluosilicic acid (30 percent) sells for 7-9 cents per pound. Ammonium silicofluoride sells at 12 to 14 cents per pound.

In using fluoride, special consideration should be given to dust control, and several methods are suggested. In general, little mechanical trouble has been encountered in handling and feeding sodium fluoride, but with sodium silicofluoride, arching and clogging of feeders may occur. Equipment used is similar to that for any other water treatment process, but special attention should be given to accuracy, dust control, and continuous recording of the amount of chemical used; manufacturers are prepared to furnish equipment that meets these requirements.

"Census of Fluoridation in the United States and Canada, 1953". Report of Committee on Fluoridation Materials and Methods. *Journal, AWW Assn.*, September.

Utility of Butterfly Valves

Owing to recent technological advances, use of butterfly valves in waterworks service is becoming more general. One of the improvements is the use of the rubber seat,

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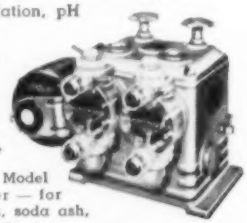

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which enables the valve to be shut droptight. Advantages of these valves include lightness of weight, smaller space requirements, ease of operation, and low cost. A disadvantage is that they do not permit a fully opened water passage. The valve is easy to operate because it is practically balanced against pressure. The stuffing box around the valve stem takes a smaller amount of motion than in other types of valves, and is easier to keep tight. It is desirable that line velocities of water do not exceed 16 fps. This brief article is given in connection with "Tentative Standard Specifications for Rubber-Seated Butterfly Valves" approved by the AWW Ass'n, May 27, 1954.

"Utility of Butterfly Valves". By Gerald E. Arnold, Gen. Supt., Philadelphia Water Dept. *Journal, AWW Assn.*, September.

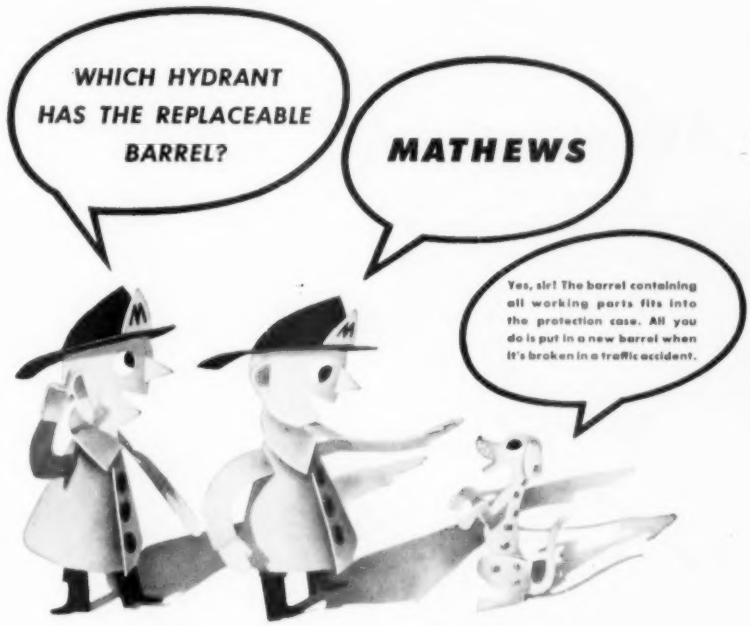
Continuous Base Exchange Softening

Softening water by the base exchange method has been practiced successfully for many years. The plants used operate on the batch system, being taken out of service at intervals for regenerating the resin. If continuous supply of softened water is necessary, a second batch unit is provided to operate meantime. Beginning in 1945, the Dorr Co. has been developing and testing a method whereby a softening unit can operate continuously; and in 1952 it installed such a unit at Baxter Springs, Kans., which is called a Hydro-Softener. This unit comprises two basic components; one for softening, divided by a horizontal perforated plate into two compartments; the other for regeneration, divided by similar plates into five compartments, these plates also containing openings through which the resin falls through the five compartments in succession. Ejectors transfer the regenerated resin from the bottom of the regenerating cell to the top of the softening cell; and others transfer the spent resin from the bottom of the softening cell to the top of the regenerating cell. Hard water passes up through the softening cell, and adjustments can be made to soften it to any degree desired. In the regenerating cell, saturated brine is introduced just below the third compartment and wash water into the bottom compartment; the latter, flowing upward, mingles with the brine at the third compartment, and the diluted brine passes up through the three top compartments and overflows to waste. There is continuous motion of the water upward and of the resin downward in both cells.

"Continuous Base Exchange Softening of Municipal Water Supplies", By A. L. Wilcox and R. D. Forger, Dorr Co. Engrs. *Public Works*, November.

Design and Operation Of Chlorination Stations

This article is a combination of three papers: "Practical Design Factors", by Joseph M. Sanchis, Dept. of Water & Power, Los Angeles; "Operating Problems", by E. Jerry Allen, Water Dept. Seattle, Wash.; and "Emergency Chlorine Supplies", by Brian L. Shera, Pennsylvania Salt Mfg. Co. The first author discussed designing of housing facilities, chlorinating equipment and appurtenances, and plant layout. He said that economy can be attained through simplification and standardization of structural design and plant layout, and by providing the type of installation that will permit adequate performance with the least amount of labor, chlorine, pumping and maintenance costs. Sample layouts are given.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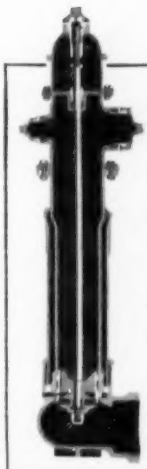

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Operating problems are discussed under the heads; Temperature control, gas line stoppages, chlorine hydrate, operating water, automatic controls, and good housekeeping. The author recommends duplicate equipment, and a program of regular cleaning and overhauling.

The paper on Emergency Supplies discusses the possibility of supplying chlorine for prevention of infection and disease in case the chlorine-producing plants in the area be put out of commission by a major disaster. Assuming industrial consumers have supplies in storage and that there are tank cars of chlorine in transit, he describes in detail how chlorine can be drawn from these into cylinders or tank trucks for distribution to priority users. Also he describes how hypochlorite solutions can be made to permit use where apparatus for distributing the gas is not available. These procedures have been planned as part of civil defense planning for the Pacific Northwest.

"Design and Operation of Chlorination Stations Under Normal and Emergency Conditions". *Journal, AWW Assn.*, September.

OTHER ARTICLES

"Permanent Spectrophotometer Standard for **Iron Determination**". By Leonard Aconsky, Taiichi Asami and Motoko Mori, Medical Laboratory, U. S. Army, Tokyo, Japan. Journal AWW Assn., September.

"Systematic Analysis of **Boiler Deposits**". By James W. McCoy, Standard Oil Co., of Calif. Journal, AWW Assn., September.

"Getting Water for **Philadelphia**". By Samuel S. Baxter, Water Com'r. Public Works, November.

"**Automatic pH Control** Saves Control Chemicals" at Macon, Ga. By Peter L. Shugart. Public Works, November.

"**Telemeter Pump Control** System Maintains Reservoir Levels" at Wheeling, W. Va. By J. F. Spangler, Supt. Water Works Engineering, October.

"Simplified Gravity **Filter Wash Trough** Calculations". By J. Sheid, Graver Water Conditioning Co. Water Works Engineering, October.

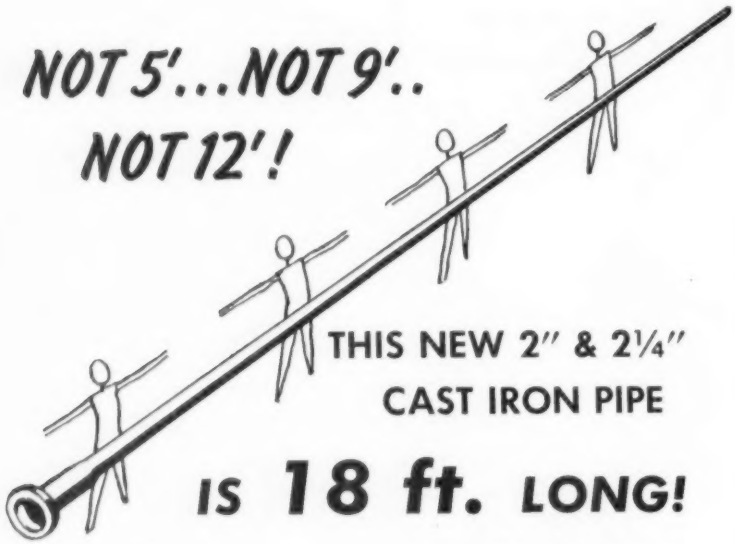
"Treatment Change (use of Calgon) Reduces **Pipe Cleaning** and Pumping Costs". By C. G. Haney, Supt. Water Works Engineering, October.

• • •

Citrus Waste Treatment

Progress is being made on the project involving the treatment of citrus waste at the University of Florida. Among the various phases of the problem under investigation is an evaluation of the flocculation and settling of solids prior to treatment in lagoons. Lime has been used in the past for this purpose but sedimentation was not satisfactory. A carryover of solids to the lagoon with ultimate settling there resulted in loading the lagoons with solids whose decomposition created a serious odor problem.

The waste involved results from juice concentration and peel oil extracting operations and has a BOD of 8000 to 15,000 ppm. The suspended solids content averages 750 ppm, and studies have indicated that the charge on the particles is only slightly negative. In an attempt to improve sedimentation, a number of agents were tried including chlorine, activated carbon, activated silica, ground dolomite, aluminum sulfate, calcium sulfate, ferrous and ferric sulfate, ferric chloride, calcium carbonate and powdered phosphate rock. The optimum pH range and optimum dosage were determined for each agent by means of jar tests. After a pre-determined quantity of each reagent was added to the waste, the pH was adjusted with lime, the mixture stirred for five minutes



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and the setting time, density of floc and BOD of the supernatant were measured.

Although the best BOD removal was obtained with activated silica, the powdered phosphate rock was judged to be the most satisfactory because of its availability and low cost. A dosage of 1½ grams of phosphate rock per gallon of waste at a pH of 8.0 resulted in the removal of 50 percent of the BOD when the detention time was 20 minutes. Under optimum conditions for the activated silica the BOD removal was 55 percent. Using lime alone, the reduction was only 20 percent and the resulting sludge was one-fifth as dense as when powdered phosphate rock was used. The results were interpreted to indicate that the major aid to sedimentation was physical with the rock adding weight to the floc thereby causing more rapid settling.

Tentative disposal of the resulting sludge is accomplished by spreading it on groves and pasture land. No adverse effects have been noticed in the groves. When the sludge is applied to pasturage, the grass becomes brown and appears dead for several weeks after which the original grazing conditions are considerably improved. This improved sedimentation procedure is presently in use at a plant in Winter Haven according to the University's publication Sanitary Engineering Progress.

• • •

Treating Water for New Orleans

The 38,939 million gallons of water that were treated by New Orleans, La., during 1953 contained 46,824 tons of suspended matter, all of which was removed in the treatment process. The hardening constituents in this water amounted to 26,467 tons, of which 40.4 percent was removed by lime treatment, resulting in a decrease of river hardness of 163 ppm to 97 ppm in the finished water. Chloramine treatment was used for sterilization, with 95 percent of the chlorine added before filtration. Chlorine residual at the plant was maintained at 0.8 ppm and the average residual throughout the distribution system was 0.55 ppm.

Total gross cost for water treated and pumped per million gallons was, for high lift pumpage $5.20; for low lift pumpage $3.17; and for purification $11.26. These costs do not include betterments and care and maintenance of parks and grounds.

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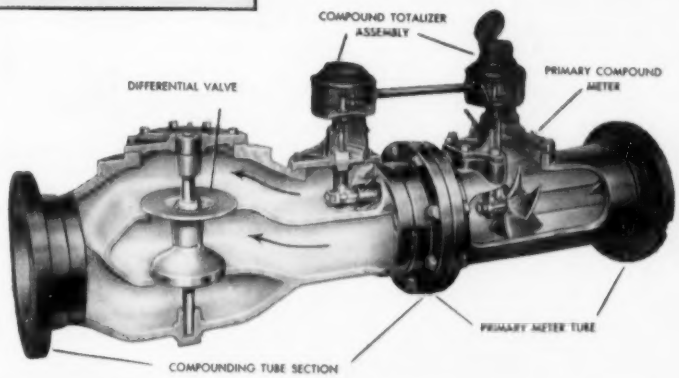

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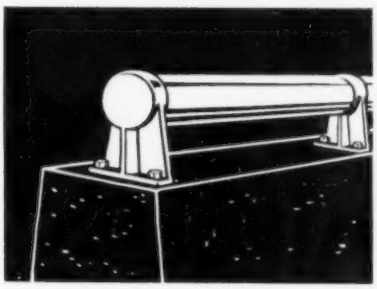

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Inhibitors of Corrosion by Traffic Salt

In a typical winter, Cuyahoga County, Ohio, uses about 5,000 tons of salt on its highway system for ice control; and 15,000 tons in addition are used on city streets and other roads. In 1949 the county engineer's office began a study of the effect of this salt in corroding vehicles and bridges, and what could be done to prevent it. It is known that some corrosion of these would take place if no salt were present. In laboratory tests, using polyphosphate type rust inhibitors, a 50 percent reduction in the corrosion rate was obtained by adding one pound of inhibitor to 100 pounds of salt in a 5 percent solution. In a 10 percent salt concentration, the inhibitor cut the corrosion rate below that of plain water. Field tests were made with steel plates fastened to the bumpers of several county trucks, some of which were used only on roads that were salted without inhibitors, while the others were used on roads where inhibitors were used. After three months, the test plates on trucks used on inhibited roads showed 40 percent less corrosion than those on the other trucks. This indicates that a major portion, if not all, of the corrosion directly attributable to deicing salt can be neutralized by the use of suitable commercial inhibitors. Whether the beneficial results would justify the expense involved in a particular location should be considered.

"Corrosion Inhibitors in Snow and Ice Control". By Samuel Sisler, Testing Eng'r, County Engr's Office. *Public Works*, November.

Applying Lime In the Form of Slurry

In reconstructing a farm-to-market road in Tarrant Co., Texas, 9 in. of pit-run gravel was placed, and enough lime applied to stabilize the top 5 in.—about 3 percent by weight. The lime was applied as a slurry, made by feeding it into a 2,000 gal. tank truck and at the same time feeding water into the truck, each at a controlled rate, and agitating the mixture thoroughly by blowing compressed air through it. An average mixture contained 6,000 lb. of hydrated lime and 1500 gal. of water. The slurry was distributed on the road by the sprinkler truck in two or three passes. No trouble was experienced with lime separating from the slurry and clogging the sprinkler openings.

"Lime Applied From Tankers", *Roads and Streets*, October.

Effect of Freezing And Thawing of Aggregates

The Road Research Laboratory of England has conducted experiments to determine how far breakdown or weakening of the aggregate under the action of frost is likely to contribute to the damage of road surfaces and bases. Eleven kinds of aggregates normally used for road making were tested, and also three kinds of low-grade materials which had given trouble when used in road work. The samples were given 50 cycles each of 20 hr. freezing at —25°C when saturated with water, followed by 4 hr. of thawing under water at 15°C. Of the normal road-making aggregates, only one was visibly damaged and two others very slightly. The three-low-grade materials were all badly broken down. The amount of breakdown was indicated by the amount of material that would pass a ⅜ in. sieve after freezing. The aggregates tested included granodiorite; limestones, carboniferous, oolitic, gritty and argillaceous (the last a low-grade aggregate); basalt; slag; gritty sandstones; quartzite; granite; and flint gravel (the only one of the high-grade aggregates visibly damaged). It was concluded that rocks normally used in road-bases and surfaces are not liable to frost damage.

"The Effect of Freezing and Thawing on the Properties of Road-making Aggregates." by F. A. Shergold, Road Research Laboratory. *Roads and Road Construction*, September.

Safety Measures In City Streets

The Institute of Traffic Engineers in 1954 cited 21 cities in nine population classifications for outstanding achievement in traffic engineering during 1953. Traffic engineers and police chiefs in 15 of these cities tell briefly what they thought were the winning measures in their respective cities. The largest cities named expressways and circumferential highways as the most important. Next, perhaps, were traffic signals (including progressive signals), street signs, center and lane line marking. Other measures were one-way streets, pedestrian walk periods, "Yield" signs, traffic meters, parking lots. Providence named, as its most important factors: police enforcement, public education, and a cooperative community spirit.

"What Cuts Traffic Congestion and Accidents?" *American City*, October.

Master Traffic Control System

Houston, Texas, last summer placed in operation what it claims to be "the world's finest master traffic control system". Electronic equipment controls traffic signal lights at 289 intersections. Of these, 135 are in the central business district, 97 are on feeder streets to the Gulf Freeway, and 57 are on major thoroughfares leading into the business area. It controls a network of 33 miles of one-way streets, and the combination of the electronic traffic control and the one-way traffic movements are thought to provide the maximum practicable traffic capacity. In downtown Houston two main sets of detectors count the volume of traffic in each direction and transmit this information to the

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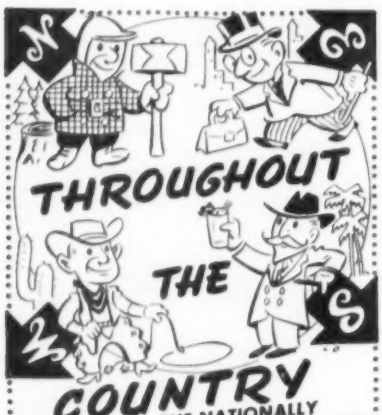

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master controller, which controls the traffic signals accordingly. It also changes the green lights to provide simultaneous timing when the traffic increases to such a point that progressive timing will no longer give a smooth flow of traffic.

"The World's Finest Master Traffic Control System". *Public Works*, November.

Effect of Road Surface on Street Lighting

At a conference in England of the Association of Public Lighting Engineers in September, consideration was given to the influence of road surface characteristics on roadway lighting. It was said that the efficiency of a street lighting installation depends to a large extent on the way in which the road surface reflected the light which fell upon it. The aim should be to make the road surface as bright, i.e., as reflective, as possible. It was recommended that light aggregates should be used in preference to dark. This is particularly advantageous in the case of surface dressings, and of chippings rolled into a surface as a non-skid finish. The use of whitened bitumen had markedly improved reflection.

"Reflection of Light From Road Surfaces". *The Surveyor*, Sept. 18.

Resurfacing Bituminous Pavements in Inglewood

Inglewood, Calif. has been resurfacing its pavements at a contract price of 4½ cents per sq. ft. After removing weeds from cracks and gutter lines and applying weed killer, the surface is heated with a pavement burner at approximately 2200°. A scarifier pulled behind the burner and penetrating about ½ inch levels the surface. While the pavement is still warm, a tack coat of SS-2 (Asphalt Institute specifications) is applied at the rate of 0.10 gallon per sq. yd. and is immediately followed by a Barber-Greene pavement layer adjusted to lay about 1 in. thickness. Rolling at the proper temperature completes the job.

"Stretching Your Maintenance Dollar on Low-Cost Pavement". By W. E. Kennedy, Director and W. E. Peebles, Asst. Dir. of Pub. Wks. *Public Works*, November.

Bright Green Street Marking

In attempting to decrease traffic accidents on its streets, Michigan City, Ind., has used most of the familiar devices for controlling pedestrians, including WALK-WAIT signals, sound truck systems, and warning tickets. In the "Walk-Wait" signal the "Walk" light is green and a slogan of "Walk on the Green" had been used. This suggested painting the entire crossing itself green. No green traffic paint was on the market, but they had a bright green paint prepared by a maker of traffic paint, which was found to last 3 to 6 months. This was tried at a few crosswalks and proved so successful that it is in general use at downtown intersections, in amusement areas, and at school crossings. The local papers consider it a "tremendous success".

"Bright Green Street Marking System Controls Pedestrian Traffic". By Capt. Lloyd H. Storey, Traffic Dept. *Public Works*, November.

Blast Furnace Slag for Paving

Blast furnace slag, granulated either by rapid cooling of the molten slag or by breaking slowly cooled slag, has grains of angular shape, with latent hydraulic properties so that they form a coherent layer when moist and subjected to pressure. When used for paving purposes, they are mixed with sand in proportion of one or two volumes of sand to one of slag. This mixture is spread and compacted in the usual way in layers not over 4-in. thick. The slag furnished the cementing agent as water acts on the outer surfaces of the particles. The mortar hardens slowly for several weeks while compacted by traffic. If cracks should form, these present fresh surfaces which, when moisture reaches them, furnish additional cement for self-healing.

"Bestratingen in Slakkenzand". By D. Thoenes, Head of Road Work Laboratory. *Wegen* (Netherlands), August.

Other Articles

"**Concrete Saw** Cuts Repaving Costs". By Phil Hirsch. Public Works, November.

"A Report on the Use of **Rubber in Bituminous Pavements**". By Harry K. Fisher, Natural Rubber Bureau. Public Works, November.

"**Soil Mechanics** Is for City and County Engineers Too". Why, and how to use it. By M. D. Morris, Soiltest, Inc., Public Works, November.

"New Technique for **Repairing Spalled Joints**". Public Works, November.

"**Quality Control** for Road and Airfield Construction" of concrete. By J. M. Fisher. Roads and Road Construction (England), September.

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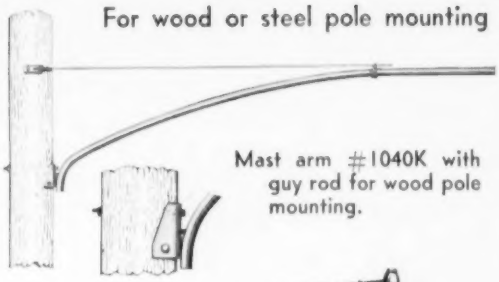
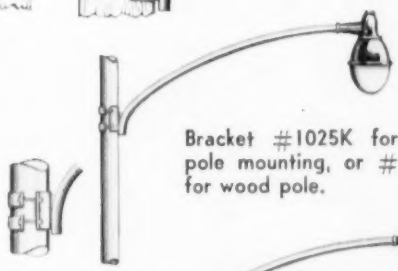


Mast arm #1040K with guy rod for wood pole mounting.



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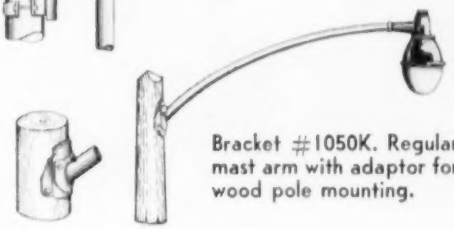

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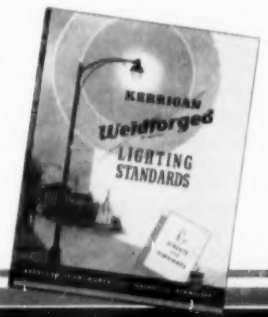

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Standard Plans and Specifications for Curbs, Gutters and Sidewalks

STANDARD plans and specifications covering the construction, reconstruction and repair of sidewalks, curbs and gutters and entrance driveways; and cutting and backfilling of pavement excavations have been prepared by Karl J. Svaty, City Engineer of Garden City, Kansas. These have been sent us, accompanied by a set of well-prepared drawings. Below is presented, in condensed form, a portion of the specifications to show the nature of the material. Space is not available to publish them in full.

Sidewalks: All sidewalk shall be constructed of portland cement concrete. Residential sidewalks shall be four feet wide and four inches thick and shall be set one foot from the property line of the street side. Commerical and industrial sidewalk shall be four inches thick where used by pedestrians only and thickened to conform to concrete paving specifications or as indicated on the standard plan where traveled on or over by vehicles. The width shall be governed by congestion of pedestrian traffic. The engineer will furnish stakes and establish line and grade.

The sidewalk shall set above the curb 1 inch for each foot of distance from the curb to the property side edge, with a maximum of three inches above the curb. All sidewalks shall be constructed to drain toward the curb. In residential districts walks will have a fall of ¼ inch to the foot. There shall be no greater fall longitudinally in any walk than one inch per foot.

There will be provided on the job a metal or wood screed to give proper shape to the sidewalk surface. A wood or cork float shall be used to finish the wearing surface, followed by a medium brush to remove all float marks. Expansion joints shall be one inch in thickness and extend from a point ¾ inch below the surface of the finished slab to the subgrade. An expansion joint shall be located at the beginning and end of each straight run, at intervals of not more than 50 feet, and at points where the new sidewalk joins old walks, curbing,. buildings, foundation, and at such other places as necessity may require and as directed by the engineer.

All sidewalk shall be cut into blocks or "stones", at intervals as directed by the engineer, by cutting through the concrete with a trowel before it has attained an initial set. The edges of the "stones" and expansion joints shall be finished with an edging tool and the joint raked clean of concrete.

The permit holder shall provide and maintain such fences, barriers, "street closed" signs, red lights and watchmen as may be necessary to prevent accidents.

Curb, Curb & Gutter, Curb and Driveway Entrance. All driveway entrances that require the removal of curb or curb and gutter, and the construction of concrete entrances or drainage culverts shall conform to the dimensions and layout of the standard plans and specification.

When constructing a driveway entrance on a street having curb and gutters, the curb returns shall be completed to a point back of the curb equal to the radius distance in all cases and the paved part of the drive extended to the ends of the returns.

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The driveway grade shall form a uniform slope from the gutter line to the grade of the edge of the sidewalk on the street side. When an entrance driveway is paved to the property line, the portion crossing the sidewalk shall conform to all sidewalk plans and specifications. A driveway entrance from a street without curb and gutter shall provide a culvert where drainage is necessary. The size will be determined by the engineer. Location shall be the street drainage ditch.

Curb that must be removed in preparation for driveway construction shall be broken at the flowline in a neat manner. The amount of curb removed shall conform to the standard plan for driveway width. Where curb and gutter are removed the gutter shall be replaced and the original gutter grade reestablished.

Pavement cut. All pavement cuts shall be kept to a minimum. Any portion of the pavement adjacent to the cut that is damaged or broken shall be removed and replaced. The repair section on all types of pavement must extend at least 6 inches over undisturbed earth. All excavation under pavement cuts shall be backfilled with sand to the subgrade of the pavement patch. Excavation in unimproved streets and alleys may be backfilled with the excavated earth which will be replaced in layers not over 8 inches thick and tamped. Flushing in place of tamping will be permitted.

The permit holder shall provide and maintain such fences, barriers, "street closed" signs, red lights, and watchmen as may be necessary to prevent accidents to residents and to the public.

• • •

Recommended Painting Practice for Sewage Treatment Plants

A detailed survey of the practices and problems in sewage plant maintenance painting was recently conducted by the Tropical Paint & Oil Company, Cleveland 2, Ohio. The results of this survey have been incorporated into a most useful 16-page report, "Recommended Maintenance Painting Systems for Sewage Treatment Plants". The report presents 11 systems of maintenance painting. Each system applies to a certain type of surface or equipment found in sewage treatment plants. Special recommendations are made where exposures to methane, hydrogen sulfide, chlorine and lime are a factor in surface protection.

Also included in the report is a

This Jaeger pumps all the water a 2" hose can handle Hi-performance Jaeger Model 2PN will actually pump all the water that can be pulled through a 2" suction line under average working conditions. Delivers 10,000 gph when operating at only 2400 to 2550 rpm (as much as 400 rpm below the speeds of similar ordinary pumps). Weighs only 160 lbs. on base, 190 lbs. on pneumatics. For complete information on this model or other Jaeger pumps, see your Jaeger distributor or send for Catalog P-4.

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table of 158 different types of equipment and surfaces from "Aerators" to "Window Sash", found in sewage plants, with qualifying data as to type of surface, exposure, and whether the surface is submerged. Each equipment listing is keyed to one of the approved painting systems. This gives a handy cross-reference between the best paint system and the equipment to be protected. The report will be sent on request.

• • •

Keeping Up Flow Capacity in Little Rock's Pipe Line

A 33-mile pipe line 39 inches in diameter conveys water from Lake Winona to the Little Rock, Ark., filtration plant. Some years ago, growths inside the pipe line reduced its capacity. In the 18th annual report, L. A. Jackson, Engineer Manager of the Municipal Water Works reports chlorine is now applied to the pipe line intermittently as it leaves the lake to control organic growth in the line. This method of treatment has been used the past four years and requires less chlorine than the continuous application used previously. One test to determine the carrying capacity of the line was conducted during the year, showing a capacity of 22.8 million gallons per day which is 91.2% of the designed capacity of the line.

• • •

Detergents

(*Continued from page* 86)

tive fatty alkyl sulfates together with a high percentage of pyrophosphate; or 20 percent of a polyethylene oxide with pyrophosphate. It is reported that built soaps contain not less than 50 percent soap, while unbuilt soaps contain about 95 percent soap and a small amount of sodium chloride.[2] Soft water tests indicate that unbuilt synthetics were only two-thirds to three-fourths as effective as the soaps. In hard water, unbuilt synthetics were somewhat more effective. Some of the phosphate-built synthetics removed as much soil as the soaps in soft water, and in hard water they retained much of their soil removing ability and were more than twice as efficient as the soaps.[3] A list of some typical household detergents is presented in Table 1 which shows those detergents which contain building agents and those which do not.

The purpose of utilizing complexing, chelating or sequestering agents in laundry washes is to tie up specific or all metallic ions. Complexing and chelating agents are usually necessary in radioactive decontamination laundry processes. A complexing agent is defined as any compound which will inactivate a metallic ion. Nearly all anions thus enter into complex formation with metal ions; and in hydrates, water molecules are regarded as being in the complex state. Likewise, a chelating agent is any compound which will inactivate a metallic ion with the formation of an inner ring structure in the molecule, the metallic ion becoming part of the ring. The efficiency of a complexing or chelating agent in laundrying is generally always dependent upon other compounds which are present. A constant interplay of forces is always present and is always acting on complexed metallic ions. As an example, complexing or chelating agents tend to bind metallic ions while precipitating agents tend to destroy the complex. As an example, in special decontamination laundries, several agents may justifiably be used to remove various trace

KOEHRING MUD-JACK® raised sunken slabs at city bus terminal (above) . . . stabilized sub-grade support under the paved parking area without interrupting traffic. Small holes were drilled through the pavement . . . then, Mud-Jack pumped inexpensive soil-cement slurry into the holes, raised the concrete, leaving solid, permanent support. Compact, portable as a 2-wheel cart, this No. 10 Mud-Jack is ideal for city work . . . no inconvenience to the public, no detours necessary. Also check the bigger No. 50 Mud-Jack for preventive maintenance and repairs on extensive highway work. Saves time, money and labor.

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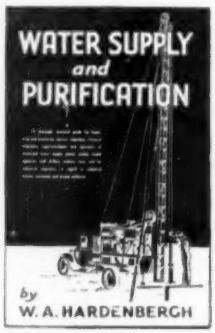

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Among the major changes introduced in this latest edition are the following: the chapters on ground water, on filtration, and on laying pipe and maintaining lines have been almost completely rewritten; the chapters on pipe conduits and on disinfection have been revised to bring the material in them up to date; and a new chapter has been added on fluoridation. Also, there are new appendices. One of these, "Planning for Emergencies and Civil Defense," contains the available information on bacteriological and radiological warfare and protection against sabotage as these subjects pertain to water works.

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quantities of radioactivity from clothing. Two powerful decontamination aids are the chelating polyamino acids or salts (Versene) and the complexing citrate ion.

Table 1—Partial List of Soaps and Synthetic Detergents

Soaps	
Built	*Unbuilt*
Dux	Chiffon
Oxydol	Ivory
Rinso	Kirkman's Flakes
Super Suds	Lux
Synthetic Detergents	
Built	*Unbuilt*
All	Breeze
Fab	Dreft
Spin	Swerl
Surf	Vel
Tide	

The chelating power of Versene lies in the strength of the metallic bond. Once chelated, only sulfides will cause precipitation of the common metallic ions. Soap has little effect on Versene; but some polyphosphates may have, depending upon the materials present as precipitating agents. Versenes are described as nonspecific, and will dissolve many metallic precipitates even though they are highly insoluble in alkali. As the pH of the Versene is reduced below 7.5, the stability of the complex decreases. The complexing reaction which takes place is given in the formula shown on page 86.

Citric acid is tribasic and manifests the usual properties of a polybasic acid. The strong organic acid is readily soluble in water, moderately soluble in alcohol, and only sparingly soluble in ether. It forms three series of well-defined salts. The salts of alkaline earth metals are readily soluble; however, the normal salts of alkaline earth metals are only sparingly soluble. Citric acid easily forms stable complex salts with many metallic ions, and many metal hydroxides are not precipitated in alkaline solution while in the presence of citric acid.

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2. Furry, Margaret S., McLendon, Verda, I, Aler, Mary E., "An Evaluation of Soaps and Detergents," American Dyestuff Reporter (Reprint), 2, Nov. 15, 1948.
3. Furry, Margaret S., McLendon, Verda I., "Effectiveness of Detergents in Removing Soil from a Cotton and a Wool Fabric," American Dyestuff Reporter, April 3, 1950.

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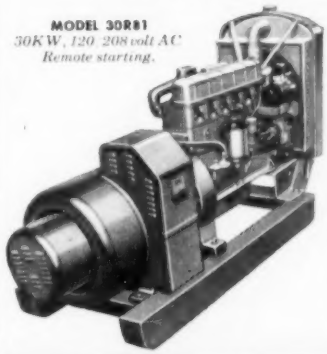

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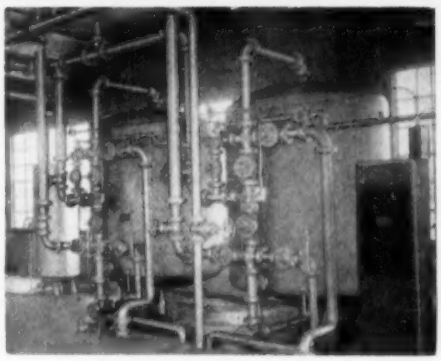

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Increasing Digester Capacity at Erie, Pa.

Erie, Pa., is increasing the capacity of its treatment plant from 20 mgd to 45 mgd and also aims to produce a better effluent. The two existing primary settling tanks will be supplemented by four new ones. Secondary treatment will include modified aeration or split activated sludge treatment. For increase in sludge digestion the city is contemplating use of the catalytic digestion systems (See "Accelerated Sludge Digestion" in our July Sewerage Digest) which, if tests now being conducted prove its success, will enable the existing three digesters to treat the increased amount of sludge to be provided for, without building any new digesters.

"A $300,000 Saving". **American City**, October.

Studies of Thermophilic Digestion

From studies of thermophilic digestion conducted during 1953 at the Hyperion Sewage treatment plant of Los Angeles, Calif., it was concluded that ether-soluble materials containing oxygen, saponifiable vegetable and animal fats and oils, were digested as readily at 85° as at 120° F. Digestion within the 85° to 100° levels was little affected by temperature changes. The increase in efficiency as the temperature rose was overshadowed by the advantages of 85° operation. But an increase of temperature to 120° produced a profound effect on the characteristics of the sludge and introduced no great operating problems; the advantages far outweighed the disadvantages. The 120° culture, when once established, was quite stable and resistant to upset; drops of 90° in 48 hr. produced no unusual changes; but prolonged holding at lower temperature showed a shift to the 85°-100° organisms. Within the limits of either range, changes of temperature made little change in degree of digestion. The culture produced by 120° digestion was quite different from normal mesophilic organisms. By increasing the digestion temperature to 120°, the solids passing a 200-mesh screen were reduced from 80 percent to 85 percent and sludge filterability was improved several fold; the solids were low in nitrogen but the gas was high in methane. To improve the nitrogen content of sludge when used for fertilizer, 120° sludge should be blended with 85° sludge.

"Plant-Scale Studies of Thermophilic Digestion at Los Angeles". By William F. Garber, Laboratory Director. **Sewage and Industrial Wastes**, October.

Sewering the Cincinnati Metropolitan Area

Cincinnati has under way a project for collecting and treating the sewage from that city and 22 other municipalities in the metropolitan area. The Little Miami plant, 29 mgd capacity, has been in operation for several years. The Mill Creek works, with 115 mgd capacity, are now under construction. Two other plants are contemplated. The cost of these works is being financed by City of Cincinnati general obligation bonds. Amortization of these, and operation and maintenance costs are met by sewer service charges levied uniformly against the whole tributary area, based on water consumption, with surcharges for wastes that exceed the strength of a defined normal sewage.

"The Cincinnati Story". By A. A. Burger. **Wastes Engineering**, October.

Stage Construction of Sewage Plants in Florida

The rapid population increases in Dade County, Fla., at a rate of approximately 25,000 a year, is being met by opening up new subdivisions. These present problems in sewage treatment, one of which is the provision immediately for the initial population and for a future growth to several times their original capacity. In one case the engineers provided primary and secondary straight-line settling tanks, each provided with scraper mechanism, so that the secondary tanks can later be used as primary. In another case an Imhoff tank was so constructed that it could be used as a digester in a later stage. In small plants, the sludge is disposed of by drawing it into tank trucks such as are used for emptying septic tanks. To avoid odor complaints, the trucks are filled inside enclosures, from which the air is exhausted through activated carbon filters.

"Solving Subdivision Water and Sewage Problems in the Miami Area". By C. E. Wright, **Public Works**, November.

Detecting H_2S In the Atmosphere

For the purpose of detecting the pressure of H_2S in the atmosphere and locating its source, in a study of odors along San Francisco Bay shorefront (thought to be probably due to sewage), the investigators devised test tiles which proved to be superior to lead acetate filter papers formerly used. Strips of unglazed porcelain tiles ("bisque") approximately 4 in. long, ½ in. wide, 5/16 in. thick were immersed in a solution containing glacial acetic acid, lead acetate and glycerine; the last to draw and hold moisture on the tiles. Any H_2S in the atmosphere darkened these tiles. It is possible to prepare standard tiles, darkened by exposure to known amounts of H_2S, so that, by comparing a test tile with a set of standard tiles, the test can be made approximately quantitative. Use of these test tiles permits sampling a large area in a short time with a minimum of manpower and equipment.

"A Simplified Technique for Atmospheric H_2S Studies". By Gerson Chanin, John R. Elwood and Ed-

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ward H. Chow, East Bay Municipal Utility District. *Sewage and Industrial Wastes*, October.

Frothing of Synthetic Detergents

Studies have been made, at the Mass. Institute of Technology, of frothing tendency and oxygen transfer of 11 synthetic detergents, and a number of conclusions drawn, including the following: The 11 detergents vary markedly in their ability to suds. Those that suds and are resistant to biological degradation are capable of causing frothing difficulties in receiving waters, especially if these are relatively clean streams. Most detergents reduce the rate of transfer of oxygen during aeration, although they vary widely in the degree of such reduction; for this reason they are responsible for increased air requirements in activated sludge treatment. Syndets which enter receiving bodies of water are capable of reducing the reaeration constant k_2.

"Physical Behavior of Synthetic Detergents". By William C. Lynch and Clair N. Sawyer, M. I. T. *Sewage and Industrial Wastes*, October.

New Sewage and Waste Works Proposed in U.S.

A recent survey of the status of planning and construction of sewage and waste treatment works showed 7,755 sewage plants in service, 404 under construction, 634 plans prepared and 687 plans in preparation. Of industrial wastes treatment plants, 40 states reported 3,652 in service and 295 under construction. The data were reported by state health departments and state pollution control agency engineers of all states but Georgia and Colorado. They also reported 2411 new sewage plants needed and 1528 plants needing improvement at an estimated cost in 26 of the states of $875,000,000. It was estimated that sewage treatment plants needed throughout the nation would cost about two billion dollars. Thirty one states reported that their state laws provide for financing sewage plants by issuing revenue bonds.

"700 Sewage Works in Planning: 650 Plans Complete, Approved". *Wastes Engineering*, October.

Financing Sewerage

One of the chief features in statewide clean stream programs is securing treatment of municipal sewage. Many cities can not secure the funds for the needed sewerage improvements or can do so only by excessive taxation. The author thinks that in such cases the state itself should furnish a considerable part of the cost, and suggests a method, along the general lines of

---

Modernized Illumination for a Boardwalk

Modernized lighting has been built along the boardwalk of Bradley Beach, N. J. After storm damage in the fall of 1953, it was decided by the city, of which E. B. Lowenstein is mayor, to install mercury vapor lights. On the mile-long boardwalk, there are now 37 Pfaff & Kendall all-aluminum Standards, with 6-ft. tapered elliptical brackets. The mounting height is 30 ft. Westinghouse mercury vapor luminaires are used. Poles have attached transformer bases and brackets have ladder rests for relamping. The photo at left shows a night view of the installation.

state highway construction. Funds for this purpose are obtained by taxes paid by the users of the roads, chiefly gasoline taxes. Fishing, recreation and shellfish propagation are all benefited by cleaning up the streams, and funds could be raised by increasing the charges for fishing and hunting licenses and taxing the oyster industry. He states that in 1953 nearly 15,000,000 hunting licenses were sold in the United States and probably almost as many fishing licenses. If 50 cents were added to the cost of each license and a tax of 2 cents a bushel be levied on oysters, and the state tax rate be increased by one cent, an annual income of $26,000,000 or more would be available for state aid for sewerage.

"Financing Municipal Sewerage". By George L. Hall. *Water & Sewage Works*, October.

Anti-Pollution Standards For The Sacramento River

California's Central Valley Regional Control Board has adopted a strict anti-pollution policy for the Sacramento river, which may discourage industries. Recently adopted regulations require that neither sulphate, chloride, nor sodium concentration in the river shall exceed the present concentrations in the river water by more than 4 ppm; that the river water shall not have a hardness concentration exceeding 4 ppm, or a total solids concentration exceeding 25 ppm, or a dissolved oxygen concentration of less than 85 percent saturation. It shall have discharged to it no substances injurious to humans, plant, animal, fish or aquatic life, or for irrigation use. Waste discharges shall not cause formation of sludge banks, objectionable discoloration, or a rise in temperature of the river of more than 0.5° F at any point, nor cause the pH of the river to fall below 6.5 or rise above 8.5.

"Tough Anti-Pollution Policy, Adopted Despite Risk of Discouraging Industry". *Engineering News-Record*, October 14.

Other Articles

"Where Does the U. S. Stand on **Sewage-Wastes Treatment?**" Reports from 26 States. Wastes Engineering, October.

"Cincinnati's New Sewage Plant". The Little Miami Plant. By David Backmeyer, Supt. Water & Sewage Works, October.

"Principles of **Chlorine Gas** Feeders". By R. W. Pearce, Builders-Providence, Inc., Water & Sewage Works, October.

"The Future of **Waterborne Wastes.** By Harry A. Faber, Editor, Water & Sewage Works, October.

"Oxidation of Enzyme Desize and Starch Rinse Textile Wastes". By Nelson L. Numerow, Univ. of No. Carolina. Sewage and Industrial Wastes, October.

"Pilot-Plant Studies of **Refinery Wastes** Treatment on Trickling Filters". By Gordon E. Mau, Chief, Water Pollution Control, Kansas State Board of Health. Sewage and Industrial Wastes, October.

"Public Health Service **Research Grants** in Environmental Health". By Irving Gerring, Exec Sec'y, Pub. Health & San. Study, USPHS. Sewage and Industrial Wastes, October.

"Laboratory Units for Continuously-Fed Biological Treatment Experiments". By Richard Hatfield and E. R. Strong, Southwest Research Inst. Sewage and Industrial Wastes, October.

Pollution of boundary waters. "Industrial Pollution of International Boundary Waters Along the Niagara Frontier". By Hayse H. Black, USPHS, and Earl Devendorf, N. Y. State Dept of Health. Sewage and Industrial Wastes, October.

"Screenings and Grit Complicate Starting Operations at Nut Island (Boston) Sewage Treatment Plant". By Joseph B. Hanlon, Supt., Sewage treatment plants. Sewage and Industrial Wastes, October.

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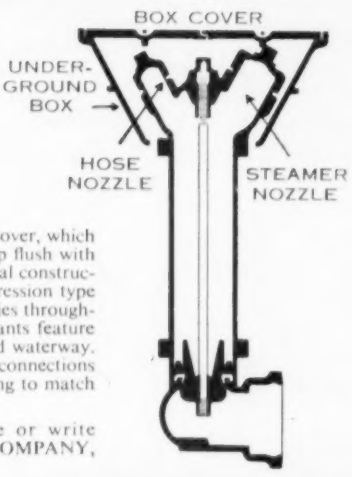

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Ohio Surveys Sanitary Fill Experience

A SURVEY of refuse disposal facilities in Ohio, as reported by the Ohio Department of Health, was summarized in the January, 1953, issue of Public Works. In discussing this survey and subsequent developments in refuse collection and disposal in Ohio Cities and Counties, publication of the Ohio Municipal League, Stedman Overman adds some interesting data on experience with sanitary landfills by several Ohio cities:

Massillon, with a population of about 30,000, initiated a sanitary landfill in 1951 and this has resulted in an annual saving over former methods of about $7,000. Because all kinds of refuse are collected at one time, it was possible with the same collection equipment to serve about 30 percent more customers. The landfill is located within a short distance of the business section of the city in an abandoned gravel pit leased by the city. The garbage and other refuse is placed in layers and compacted with a crawler tractor with a clam attachment. Cover material of a sandy loam soil, which gives excellent compaction, is obtained from the top and sides of the pit. So thorough has been compaction of the refuse and cover material that there has been practically no settling of filled areas.

R. F. Snyder, sanitary engineer of Massillon and supervisor of the municipal refuse collection and disposal program, says:

"Our landfill is not only providing a sanitary means of disposal for the city's refuse but is going to make a valuable piece of property out of a once useless gravel pit. The city foresees no trouble in obtaining later landfill space after demonstrating the job that is being done at the present site."

Elyria, also about 30,000 population, discontinued contract collection which cost $25,000 per year and created much nuisance. Five 12-yd. packer-type bodies and a crawler tractor and bull-clam were purchased at a total cost of $60,000. For a disposal area, 50 acres of land were leased. The city borrowed $75,000 to buy the equipment and start the program, charging $1 per month for residential collection. After 2½ years of operation, all but $5500 of the original cost has been paid off and the remainder was expected to be paid by the end of 1954.

Tiffin, population about 20,000 also had the contract system, with many complaints due to poor service and careless operation of the open dump. Two 16-yd. packer type trucks and a tractor and bull-clam were purchased and seven acres of land leased. The cost of setting up the program was $32,000, which was paid out of the general fund. Collection charges of $1 per month are expected to pay back the original cost.

Villages have also given this problem attention. The village of Westerville, population 4,112, offers an outstanding example of satisfactory village refuse collection and disposal. Westerville formerly depended on private haulers for most of its garbage and refuse collection service. Within one-half mile of its residential section was located one of the worst dumps in Franklin County. Not only was it used by the people in Westerville but garbage and trash haulers brought their collections in from all over the county. The dump was on fire most of the time. A heavy infestation of rats and flies thrived at the place.

One of the first things Manager Ralph W. Snyder did when he came to Westerville was to set up a plan to provide adequate refuse collection and disposal service for the village.

A 9-cubic-yard packer truck was purchased to provide collection service. A tractor with a 1-yard bullclam was purchased for operation of a sanitary landfill. Land was obtained adjoining the dump for landfill purposes and the old dump was eradicated of rats and used for landfill.

To start this program, the village transferred $6,000 from a surplus fund of another utility and issued $10,000 in mortgage revenue bonds. A service charge is made to pay off the bonds and to pay the operating costs of the program.

One of the best examples of what small villages can do to solve the garbage and refuse disposal problem is demonstrated in Putnam County. In this county an association has been formed to operate a sanitary landfill. The landfill is used by nine villages and six townships in the area.

Each village and township pays to the association a certain amount based on its population for use of the landfill. The cost to a village or township amounts to approximately 50 cents per person a year.

The association contracts to have trenches dug in which the refuse is placed. A 20-acre site of land belonging to the county is used. Vil-

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Seen in the group picture, left to right, are Stephen L. Lyon, Sewer Service Division, Larry Hanifon, Assistant Foreman, Churchill (Shorty) Brewster, Operator, and Gilbert (Jack) Miller, Operator.

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lages haul from 2 to 15 miles to the landfill. When the fill began operation in February 1954, a trench was dug approximately 100 feet long. Refuse from the villages and townships is placed in the trench as it is hauled in. A heavy bulldozer is brought out at frequent intervals to compact the refuse and cover it with two feet of earth. After 6 months' operation nearly one-half of the first trench has been filled and covered.

Making Brackish Water Potable

CHARLES E. CARL, Director

Division of Sanitary Engineering

South Dakota Dept. of Health

TO determine the economic feasibility of converting high solids water to water better suited for domestic use tests will be conducted at Miller, S. D., in early 1955. The experiments will be carried out under provisions of the saline water conversion program legislation sponsored by Senator Case. The entire study, of which the work at Miller will be only one phase, covers a five-year period and carries an appropriation of $2,000,000.

Prior to the selection of Miller as the site for the proposed study, considerable preliminary work was undertaken. The Experiment Station at the South Dakota School of Mines, under direction of Dr. J. H. Cope, collected and compiled data pertaining to water supplies, and much of the data on the mineral analyses of municipal supplies in South Dakota were furnished by the State Department of Health. Also co-operating were the Natural Resources Commission, the State Engineer, the State Geologist and other agencies.

After careful consideration of the data in order to locate a representative municipal supply that would provide a fair test of the demineralization procedures to be used, Washington representatives of the saline water conversion program visited several South Dakota communities before selecting the site. These two men, Joseph J. Strobel and Ernest Sieveka, were met by Health Department representative R. J. Stapf and driven to the communities they wished to visit. Immediately following this tour a conference was held in Pierre and Miller was selected.

Procedures have been available for some time to convert brackish water to a more satisfactory supply, but the cost has made the process unobtainable to South Dakota cities. Under the present study program, a prime objective is to develop a method of converting high solids content water to a low solids content water that will be sufficiently low in cost to be economically feasible for communities to use. The process to be used at Miller has been developed by Ionics, Inc., and consists of selective membrane filters, which are activated by an electric current. It is hoped that the Miller water solids may be reduced from about 2,000 ppm to 350 to 500 ppm. It is understood that the equipment to be used is completely self contained on a trailer, including a source of power supply. Operating costs will be kept, together with water quality determinations. At the conclusion of the experiment there should be suf-

ficient data to help evaluate costs.

The South Dakota Department of Health will co-operate with the actual operating experiments. Miller will need the water that goes through the treatment process so adequate safeguards will be established to assure the purity of the treated water. The Department laboratory will assist in the necessary mineral and bacteriological determinations, and an engineer from the Division of Sanitary Engineering will be assigned to work with the unit while the experimental activities are underway at Miller.

Traffic Control

(*Continued from page 77*)

nose of the exit ramp island, carries the interchange number. It acts as a confirmatory type sign and serves to delineate the separation of the ramp from the roadway.

All signs used on the Turnpike are reflectorized or illuminated and the copy size ranges up to 30 inches. Messages to be clearly understood under high-speed operation, and to allow adequate perception and reaction time, must be large. This is of primary importance on a limited access highway where the distance between exits may be as much as 15 miles so that failure to make the proper exit will result in considerable lost time and add many extra miles of travel.

Regulations concerning vehicle sizes parallel those in force in the State of New Jersey. Any vehicle over 50 feet in length, 13 feet 6 inches in height or 8 feet in width cannot legally travel the Turnpike. A special regulation prohibits a rearward overhang greater than four feet from the permanent body of the vehicle. Construction equipment, except that under contract for work on the Turnpike, is excluded. Also, any vehicle unable to maintain a speed of 35 miles per hour in normal weather on a flat grade is prohibited from using the Turnpike for obvious safety reasons. The regulations stated above are inflexible and no permits have ever been issued for non-conforming use. Even the stated exception to the regulations concerning Turnpike construction equipment is carefully controlled and supervised. These vehicles are allowed to move only on days and hours of low traffic volumes and when parked during off-working times must observe certain safety measures.

Any construction work on the roadway is carefully supervised by the Turnpike engineering department and the construction operating procedures must have the approval of the Traffic Engineer to insure safeguarding traffic movements. The days and times of day when this work is to be performed are also limited.

• • •

Compact Waste Treatment

(*Continued from page 73*)

units further away from the center of operations. The units such as the electric control panel; the pump controls, including the float control; the flow meters; and the sanitation facilities should be directly available. The drawing illustrates the basic fundamentals of arrangement.

The design of the extra footings for the support of units directly abutting the Control House has been the serious deterrent to the construction of the compact type plants, each plant must be independently designed and one man must do the majority of the design.

Obviously each building must be divorced from the adjoining building by a space of about two feet for construction reasons. Assuming

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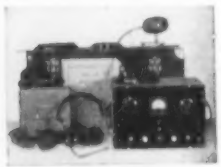

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that a digester is to be used, it should be connected to the Control House with a tunnel containing gas and heat equipment; and divorced from the main building by a small well-vented compartment and fire doors.

The shortness of the pipe runs will usually permit use of a maximum of pipe of one size with a small cost increase. Assuming that the plant becomes out-grown, it is a simple matter to extend these over-sized lines and add additional units in an additional concentric circle. A sewage treatment plant will be fortunate if it lasts the normal twenty-year period without need for increase and this need should be given definite consideration at the time of design.

The compact design has certain advantages:—

1. *Appearance.* Because of the compactness, the units can be dressed up as a unit with more pleasing appearance.

2. *Odor Control.* This is relatively simple because of the grouping of the buildings.

3. *Expansion of the Plant.* The concentric circle theory of expansion reduces the cost of expansion and normally reduces the need for land purchase after the original acre or two has been obtained.

4. *Operation.* The operator will have all units available, rain or snow, and will tend, because of their availability, to take better care of the plant.

5. *Controls.* The construction of by-passes is a simple matter because of the closeness of units to each other; sampling is simple and not too physically exhaustive; or automatic samplers can be placed in the Control House.

• • •

Walkie-Talkies

(*Continued from page 59*)

As previous use of flags or hand signals have been confusing and as frequent oral contact between crews is necessary, such an operation is almost impossible unless Walkie-Talkies are available. It has been our experience on several occasions while cleaning a siphon structure that, had we not been using these units, serious and costly situations would have resulted.

As is often the case in sewer maintenance operations, work cannot always be performed when time or weather is desirable, but must be done as conditions demand. In many cases, either because of traffic conditions or heavy sewage flows during

daylight hours, it has been impossible to perform the required work except during the night time. Prior to use of Walkie-Talkies the coordination of the work between crews had to be carried on by use of light signals or other means which were inadequate and in many cases resulted in poor operation and serious loss of time.

Many of the large trunk sewers in the metropolitan area are located in streets along which are situated many large commercial or industrial buildings having basements in which are located floor drains or toilet fixtures which are just above the level of the sewer in the street. While an ordinance now requires the installation of a check valve on all such connections, many of the older buildings do not have one or those they have are inoperative; thus the cleaning of the main sewer poses many operational problems in preventing sewage from backing up through the connection and causing extensive damage to stored materials. Immediate oral contact between the man in the basement watching the outlets and the crew in the street is highly essential to prevent serious damage and to facilitate the work being performed.

In view of the above specific operations and the many incidental operating problems connected with the maintenance of such a large system where immediate and constant contact between operating crews is highly essential, several types of Walkie-Talkie units were investigated and tried out in the field under actual operations. The units shown in the photograph on page 59 have proven most successful in actual use.

The use of these Walkie-Talkies in the cleaning of sewers and storm drains has provided immediate communication between operating personnel and has eliminated the use of flag or light signals, thereby greatly increasing the efficiency of cleaning operations and reducing the possibility of accidents or work failures. It has been our experience that the units are not too successful when operated between crews in the drain and surface personnel. At such times line phones are used as wires need not be laid along the ground surface but need only surface at the manhole where the cleaning and lifting equipment is located.

In addition to the above, it is surprising how many uses the units are put to and how they add to the general overall efficiency of the operating Division.

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EQUIPMENT NEWS

Published Monthly December, 1954

Light-Weight Vibrating Feeder Delivers Over 300 Tons per Hour

Although capable of capacities in excess of 300 tons per hour, Barber-Greene's newly announced "Redi-Flow" vibrating feeder is nonetheless a handy, light-weight unit. It is made in 20 and 26-inch widths for feeding 24 and 30-inch belts. Lumps up to 12 inches in size can be handled, when mixed with fines, or to 8-inch maximum when the lumps are of uniform size. Capacity is, of course, dependent upon the size and type of material handled, but averages 200 tons per hour for the 20-inch unit and 300 tons or more, with the 26-inch unit. Sand, gravel, crushed stone, coal, slag and cinders are but a few of the many materials which have been successfully handled.

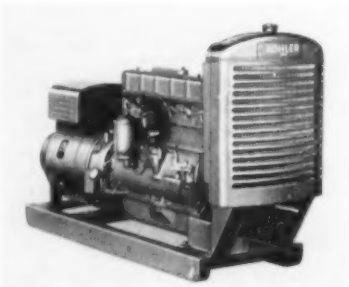
Several operational features of the feeder contribute to maximum belt protection. The short stroke and compactness permit discharge very close to the belt and thus prevent impact damage to belt or carrier. Vibration in the hopper, as well as in the feeder, prevents segregation and seats heavy lumps in a bed of fines. Material is propelled in the direction of belt travel at the moment of transfer from feeder to belt. And proper belt alignment is promoted by concentrating the load directly and evenly in the center of the belt.

Mechanical vibrating device gives high output to light weight feeder

This feeder is shipped completely assembled, aligned and adjusted and is easily attached to any hopper on the job. Information and specifications from Barber-Greene Co., 400 No. Highland Ave., Aurora, Illinois, or circle No. 12-1 on the coupon.

New Electric Plant Has Remote or Standby Starting

This plant is available in six different models with remote control or stand-by starting, and with varying voltage outputs. The six cylinder engine produces 15 hp at 1800 rpm and has a 3½" bore and 3¾" stroke. Intake valves are of chrome nickel and exhaust valves of chromesilicon; pistons are of an aluminum alloy. Remote starting is accomplished through an on-off switch on the plant or by a two-wire remote control. Stand-by starting, which automatically starts the plant and transfers the load whenever regular service fails, is through an emergency transfer panel with a 75-amp built-in transfer switch. More from Kohler Co., Kohler, Wis., or circle No. 12-2 on the coupon.



15 KW gasoline-powered Kohler plant

Two Automatic Systems Proportion Chlorine to Main Line Flow

Two new systems for automatically proportioning chlorination rate to main line flow are provided by Fischer & Porter. These are air operated automatic proportioning and pump sequence proportioning. The air-operated automatic proportioning system is designed to proportion chlorine flow so as to maintain constant dosage in a varying main line flow passing through a flue or weir. The dosage is simply set by a manually operated regulator mounted on the chlorinator. With this unit, little or no attention is necessary to maintain the correct chlorine flow rate for constantly fluctuating main line flow rates.

The pump sequence proportioning system is designed to increase or decrease the chlorine flow rate by set increments as one or more main line pumps are switched on or off so as to maintain constant dosage for main line flows. It is particularly useful where chlorine demand remains relatively constant and where main line flow rate is dependent on multipump systems in which one or more pumps operate. In operation, when an additional pump, in a multi-pump installation, is started in order to handle an increase in flow, the chlorinator automatically increases chlorine flow rate an amount proportional to the additional pump capacity. More from Fischer & Porter Co., Hatboro, Pa., or circle No. 12-3 on the coupon.

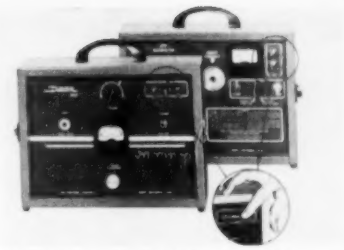
Instantaneous Battery Testing for Pipe Detector

A battery test switch for the instantaneous testing of both transmitter and receiver batteries is now being engineered into the latest Detectron pipe detectors. With this, the operator can have positive assurance of maximum battery function

at all times while detecting, tracing and estimating the depth of buried pipes, cables and conduit. By merely touching the test-switch, an immediate reading of battery condition is possible. Batteries in poor condition may be replaced in the shop or extra replacement batteries taken into the field. The more important functions performed by this new model are the detection of unknown pipes and conduits—also cables, valves, services and stubs. It will also trace buried pipes and conduits and will center them to determine the exact location. Detection of unexpected or unknown metal objects is also possible and where there are close parallel pipes and conduit, the unit will determine the exact center, depth and location of any one of many pipes. Technical data rom The Detectron Corp., North Hollywood, Calif., or circle No. 12-4 on the coupon.

Flexibility Distinguishes New River-Crossing Pipe

It's not a new angle—15°—but a new angle to which river-crossing pipe may be deflected without impeding the flow of the pipe's contents. The reason for this free-flowing characteristic, even with extreme deflection, lies in the ball-and socket design of the newly introduced Clow cast iron river crossing pipe. Other advantages claimed for this construction are: only 3 pieces to each joint (1 complete pipe, 1 solid follower ring, 1 solid ring gasket), besides the bolts and nuts; no split parts; rubber gasket symmetrical in cross section, cannot be installed the wrong way. Lower labor installation costs result from the greater ease of joint make-up and from the longer laying lengths (approximately 18'6" long). Complete details from J. B. Clow & Sons, 201-299 No. Talman Avenue, Chicago 80, Illinois, or circle No. 12-5 on the coupon.



Detectron pipe detector with test switch for quick check on battery

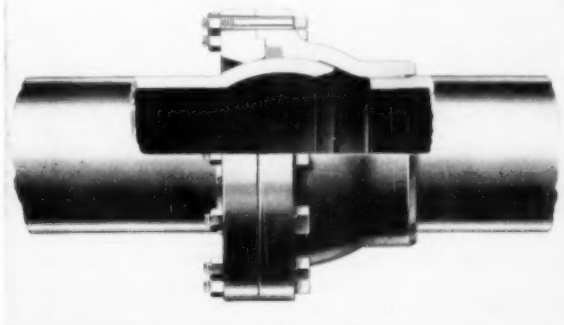
Integrator Offers Multi-Range, Simplified Operation

A new model Integrator—a device that mechanically computes the metered volume of gases, steam or liquids from orifice meter charts—which offers larger capacity, simplified change-over, speedier operation and increased resistance to wear, is now available. Electrically operated the Integrator has a counter setback assembly operating from the main calibration post that enables the operator to run practically all ranges of charts at any base pressure. As a result, range settings are almost infinite in number. The same setback principle has been applied throughout the machine, eliminating the various separate pen centers and pressure range hole segments. Thus, when the machine is in calibration for one make of orifice meter charts, it is in calibration for all makes of charts that the machine will calculate. Further information from Rockwell Manufacturing Company, 400 North Lexington Ave., Pittsburgh 8, Pa., or circle No. 12-6.

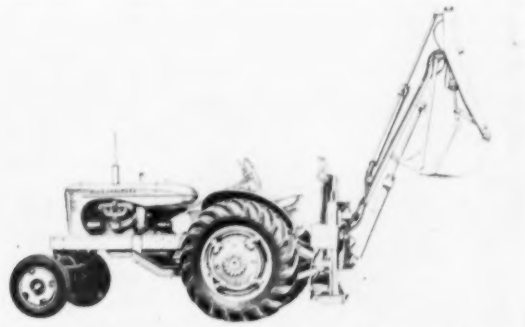
Conveyor for better truck loading. A 15-ft. powered conveyor is now available which can be raised or lowered hydraulically for use on the Eagle truck-mounted loader. Discharged material can be accurately placed on the truck and will reach higher trucks, and the greater length is useful where the truck travels directly ahead of the loader. The extra length conveyor and the hydraulic control are both optional features. Complete data from Eagle Crusher Co., Galion, Ohio, or circle No. 12-7 on the coupon.

Henry Hydraulic Attachments Built for A-C Tractors

Allis-Chalmers has added the Model WD-45 wheel tractor equipped with the Henry backhoe. Other Henry hydraulically operated attachments, including backfiller blade, straight and angle dozers and front-end loader, are also available for the WD-45. Weighing approximately 4,000-lbs., the WD-45 is powered by a gasoline engine, 45 horsepower. Making up the basic unit is the WD-45 tractor and the Henry backhoe. Attachments available to municipalities, contractors, utilities, industrial plants and other users include five buckets 16 to 24 ins. wide, interchangeable with the backhoe for use in stockpiling, truck loading and other dirt moving jobs. Maximum loading height with the rear-mounted unit is nine feet. Front-mounted attachments include the 1/3-cu. yd. front end loader for digging and loading; a backfill blade for light dozing and clearing, stockpiling, snow removal, cleanup and general maintenance work. There is also a lift fork, crane hook, and straight and angle dozers. The rear wheels arrangement permits the operator quickly to adjust rear wheel tread with engine power to the width required for maximum stability when working in soft ground, or performing other material handling jobs. More from Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis., or circle No. 12-8.



Ball-and-socket joint gives free flow in river crossing pipe



Allis-Chalmers tractor shown with Henry hydraulic backhoe

Self-Propelled Clipper Concrete Saws

Cutting contraction joints in green concrete slab with self-propelled Clipper saw

Two new concrete saws, designed for continuous heavy duty, such as cutting contraction joints in new concrete, (highways, airports, and warehouse floors), and sawing the boundaries of sewer and utility trenches in old pavement, have been announced by Clipper. Ease of handling makes the same saws practical for other jobs—cutting boundaries of repair patches and maintenance work in plant floors and drives.

Power for propelling the saw is supplied from the gasoline engine to a variable speed transmission. Two abrasive-coated drive wheels operate in direct contact with both rear wheels of the saw. These drive wheels maintain traction without slippage, even under most unfavorable conditions. Speed of the saw is infinitely adjustable, from zero to approximately 12 feet a minute. Toe pedals, easily reached from operating position, engage and disengage the transmission. Two-wheel drive holds the saw on a true course for cutting a straight line, without drifting and consequent extra blade wear. Another feature which keeps the saw moving in a straight line is the rigid 4-wheel mounting of the saw chassis. This is made possible by a floating front axle. In effect, the blade is suspended on 3 points; when the wheels pass over an uneven surface, the blade remains straight in the cut, without twisting, and with minimum binding.

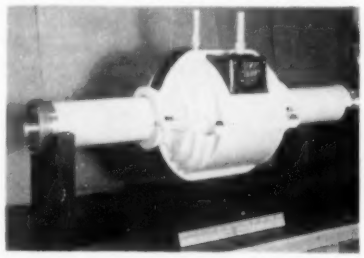
Although both saws are large heavy-duty machines, one man can easily break them back on the rear wheels, and readily maneuver into cutting position. This is a particular time-saver on short cuts. One man also can take either saw over a curb or similar obstruction. Further data from Clipper Manufacturing Company, Suite 745, 2800 Warwick, Kansas City 8, Mo., or circle No. 12-9.

Crenlo Cab for Caterpillar Shovel

This roomy, reinforced cab for the Caterpillar #6 Shovel extends beyond the hydraulic controls on the right side to provide easy operation of the shovel, and over the starting engine control, so all starting operations can be performed from the operator's seat. Doors allow easy entrance and exit from either side. Body panels are built of 12-gauge steel, reinforced by steel framing. Doors and all edges between cab and tractor are thickly weatherstripped. Simple installation and removal of the cab can be made without disconnecting any hydraulic lines or altering the tractor. Vertically mounted windshields permit a clear view of shovel operations; the rear window swings open for ventilation. Optional equipment includes electric or air windshield wipers and tinted glass. For additional information write Crenlo, Inc., Rochester, Minn., or circle No. 12-10 on the coupon.

New Magnetic Meter Handles Larger Lines, Unlimited Flows

A new electromagnetic flow meter, designed for 2-in. to 8-in. flow lines, has been introduced by Foxboro. Incorporating the advantages of electromagnetic metering, the instrument is additionally rated for unlimited maximum flows, making practical a number of flow measurement applications normally impossible. The meter will measure the volume flow rate of any liquid of sufficient conductance and velocity, unaffected by the pressure, viscosity, density or changes in conductivity of the flowing liquid. It is recommended for aqueous solutions, slurries, acids and other corrosives, in addition to food and drug products requiring sanitary processing.



Over-all accuracy is within ±1 percent of the scale span from maximum flow down to zero flow despite such factors as turbulence, dirty flow, etc. The meter produces no more pressure drop than a length of pipe equivalent to the meter tube. Specifications from Foxboro Co., Foxboro, Mass., or circle No. 12-11.

6-Roller Pipe Cutter

A new heavy duty 6-roller pipe cutter is specially designed to prevent spiraling when used with power drives; it will handle ⅛″ to 2″ pipe.

Features that save time and improve performance in cutting operations include: simple design; easy to see cut-off mark; rollers provide true alignment, assuring square cut-off; tracks perfectly. More from Toledo Pipe Threading Machine Co., Toledo, Ohio, or circle No. 12-12 on the coupon.

Wagner Front-End Loader for New Oliver Tractor

Designed for a wide range of materials handling operations in construction and industry, a medium priced heavy duty loader for the new Oliver Super 55 tractor has been developed by Wagner. Known as Model WF3, the new loader employs the Wagner independent live power system with double-acting third cylinder controlled attachments for faster operation. A heavy bumper guard protects the hydraulic pump and tractor radiator. A number of quickly interchanged attachments are available for specialized materials handling jobs.

Featuring 2,000-lb. breakaway, the unit handles live loads up to 1000 lbs. with 10-ft. lift to heel of bucket,

Wagner loader has unit-welded construction; low overhead clearance

dumping at a clear height of 8½ feet. The loader may also be mounted on a number of other popular tractor makes and models. More from Wagner Iron Works, 1905 S. First St., Milwaukee 1, Wis., or circle No. 12-13 on the coupon.

Audible Alarm System Polices Traffic Speed

An electronic device reduces the speed of traffic in critical areas such as school zones, recreation areas, small communities and congested sections. The systems are installed at each entrance to speed zones and vehicles entering zones in excess of pre-selected speeds set off a short siren warning. The audible warning alerts drivers that they are exceeding speed limits—warns pedestrians that vehicles are entering the zone at excessive speeds and points an audible "accusing finger" at violators as an aid to law enforcement officials. The system is simply installed and serviced.

According to the manufacturer, in test installations at schools where the Zonelarm System is pre-set to sound alarms between 8:00 AM and 9:00 AM; 12:00 PM and 1:00 PM; 3:00 PM and 4:15 PM the system is doing an excellent job of slowing traffic with the effects carried over throughout the day. In a typical school installation warning signs are set at each school entrance in the following manner: 750 ft. before the school zone, the sign reads, "Warning, Audible Alarm for Excessive Speed"; 500 ft. before the school zone, the sign reads, "School Zone—20 MPH"; 250 ft. before the school zone, the sign reads, "Slow, School Zone Ahead". Any motorist disregarding the warnings and exceeding the pre-selected speed sets off the device and reduces speed immediately at the siren sound. Literature is available from Zonealarm Corporation, 712 East 163rd St., Cleveland 10, Ohio, or circle No. 12-14 on the coupon.

This High Pressure Steam Cleaner Handles Many Jobs

A new line of hypressure jenny steam cleaners is announced by Homestead. Each of the nine models in the line features 180 gallons per hour steam cleaning capacity for removing heavy deposits of grease and dirt from machinery, equipment, trucks, parts, etc. Two of the models are available with finger-tip control of flushing and rinsing capacity up to 480 gallons per hour. Designed especially for either single gun or two gun operation, these offer a choice of oil-fired or gas-fired units in either stationary or portable type. For field use, or anywhere that electric current is not available, units are available with gasoline engine drive in place of electric motor. Automatic electric ignition, and the

"Hypressure Jenny" heavy duty cleaner

ability to generate steam-cleaning pressures within two minutes from a cold start, give maximum utility. Facts and specifications from Homestead Valve Mfg. Co., Coraopolis, Pa., or circle No. 12-15 on the coupon.

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Glazed Tile
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Permanent • No corrosion or tuberculation • Equal distribution • Low loss of head • Requires only small sized gravel • No metal in contact with water!

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sliding or screw type cast iron valve boxes for covering 4" through 10" valves for water or gas. Rugged construction for lifetime service. 5¼" shaft. Extensions as required.

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ALABAMA PIPE CO APCO
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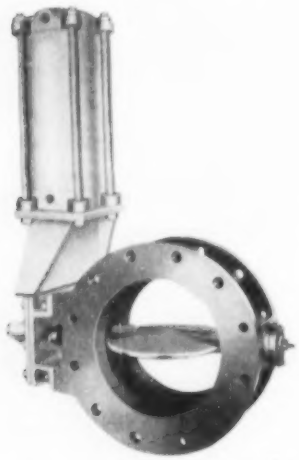
Builders-Providence Butterfly Valves

Builders-Providence is extending its line of butterfly valves to include rubber-seated, tight-closing butterfly valves for general service. Good design and rugged construction are combined for fine performance in these valves which meet



Tentative Standard Specifications AWWA C504-54T. Accessories include manual, electric, hydraulic and pneumatic operators. For bulletins and technical data on the Model BV butterfly valve, write Builders-Providence, Inc., 345 Harris Ave., Providence, R. I., or circle No. 12-16 on the coupon.

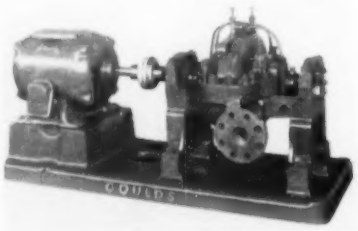
Ferguson Pipe and Cable Layer

Specially designed to install flexible pipe and cable underground at low cost, the new Ferguson pipe and cable layer eliminates laborious hand digging or expensive machine trenching. This tool quickly attaches to the Ferguson Tractor, and will lay flexible piping up to 1½-in. to 18-ins. deep. To lay flexible pipe or cable, an exploratory subsoiling pass is first made with the tractor and subsoiler over the route of the projected line, so that any roots or other underground obstructions may be cleared away. Then the length of pipe or cable to be installed is laid out right alongside the cut. The pipe or cable is then threaded through the front guide ring on the tractor, rear guide ring, and guide tube attached to the subsoiler beam. When the tractor is driven forward, the subsoiling beam goes deep into the ground and the piping or cable slips through the guides, automatically being deposited at the bottom of the cut. More from Ferguson Div., 1721 Packard Ave., Racine, Wis., or circle No. 12-17 on the coupon.

Goose neck hoe boom. This back hoe attachment is standard for the 1/3, ⅜ and ½ cu. yd. Little Giant machines and gives a digging depth of 19 ft. 5 ins. on crawler mounting and a dumping height of 8 ft. 6 ins. A greater digging depth, faster operation and a bigger pay load are said to be possible with this unit. Available on crawlers or for truck mounting; fully convertible to other attachments. More from Little Giant Crane & Shovel, Inc., E. 16th & Howard Drive, Des Moines, Ia., or circle No. 12-18 on the coupon.

New Two-Stage Pumps by Goulds

A new series of two-stage pumps for handling clear liquids, announced by Goulds Pumps are available in 5 sizes, providing heads up to 1,000 ft., and capacities up to 1,000 GPM. Opposed impellers insure hydraulic balance, and thrust balance is achieved by the use of a unique new labyrinth diaphragm. Bearing spans have been kept short, resulting in a space saving of as much as 50 percent. Wide interchangeability of parts has been provided, so that spare parts inventories can be kept at a minimum.



For example, only two shaft and rotating parts assemblies are necessary to cover all five pump sizes.

Direction of rotation of the pumps can be changed in the field, without any additional parts; and they can be supplied with either conventional stuffing boxes or with mechanical seals, as desired. More from Goulds Pumps, Inc., Seneca Falls, N. Y., or circle No. 12-19 on the coupon.

• • •

Public Health Section Conference on Weed Control

The Public Health Section of the Northeastern Weed Control Conference will have a special one-day program, January 6, at the Hotel New Yorker, New York City, to discuss weed control as it relates to public health. More from R. C. Sweeney, Box 670, White Plains, New York.

Personal News

Marion Boriss has resigned as city engineer of Chattanooga, Tenn., to become Assistant Director of Public Service of Miami, Fla. He had held the Chattanooga position since 1947, and has done outstanding work there. Previously he had been in Birmingham, Ala., as county sanitary engineer, his service there being interrupted by Army service. He is now a Lt. Col. in the Eng.-Res.

Edward S. Hopkins, formerly principal associate engineer of the Baltimore Bureau of Water Supply, has retired from that position and has opened a consulting office with Harry Hall of the Washington Suburban Sanitary District at 306 N. Charles St., Baltimore 1, Md.

Hubert S. Miller, Colonel of the Corps of Engineers, has retired after 36 years of service, and has joined with William J. Wenzel to form the consulting engineering firm of Wenzel & Miller, with offices at 41 Meadow Lark Drive, Great Falls, Mont.

William R. Seeger has been appointed General Manager and Chief Engineer of the Marin Municipal Water District, San Rafael, Calif.

• • •

Widely Experienced Sanitary Engineer Available

Sanitary engineer, 43, with BS in civil engineering and MS in sanitary engineering is available. Eight years of experience in state sanitary engineering work; four years with the Sanitary Corps of the Army (doing an outstanding job in the SWP); and nine years with the Rockefeller Foundation in administrative, cooperative and education work, largely in South America. Excellent recommendations. Interested in a position in education, public health, industry or engineering work where his management, administrative and technical skills can be utilized. Write Box 12BS, Public Works Magazine, 310 East 45th St., New York 17, N. Y. Messages will be forwarded but not acknowledged by Public Works.

• • •

City Engineer-Director of Public Works Wanted

The City of Tracy, Calif., Robert L. Williams, City Manager, desires applications for the position of City Engineer-Director of Public Works. Population of city is 9500; salary starts at $550 and goes to $600 after six months. Non-civil service.

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P. O. BOX 4095
BATON ROUGE 4, LA.

Experienced Sanitary Engineer Available

Sanitary engineer, BS in civil engineering, MS in sanitary engineering; 8 years in public health; 4 years in Sanitary Corps of Army, 9 years overseas, largely South America, with Rockefeller Foundation, desires location in US, teaching, public health, industry or engineering. Experienced in administration and management.

Write to:
BOX 12-B5
Care of this Magazine

City Engineer Wanted

Unusual opportunity for graduate civil engineer, or equivalent, with professional license, in southern Pennsylvania city. Experience is essential in land surveying, street layout, sanitary and storm water drainage, and related work. Experience is desirable in application of zoning laws and sub-division control. Successful applicant would be in responsible charge of Engineering Department, supervising survey crew and draftsmen; and would be expected to deal with the public in the many problems arising in the operation of a City Engineering Department.

Attractive salary, pleasant working conditions, permanent position for right man. No political interference. Man under 40 preferred. Reply should state age background, and specific experience in the above-mentioned fields.

Reply to:
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Shops Superintendent for the City of San Diego. Ages 21-52. Directing all activities of the Equipment Division—annual budget of $1,300,000, 750 pieces of equipment and 100 personnel involved. Salary $559 to $679 a month. Equivalent to Mechanical Engineering degree and five years responsible experience in field required.

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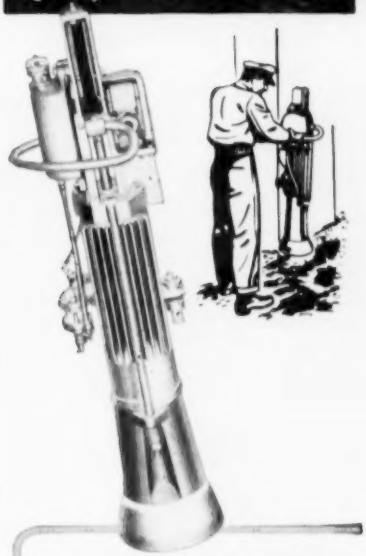
—Worth Seeing

City Engineer Williams, Hagerstown, Md., accepting for Mayor Burhans $100 for guessing number of matches in bowl at Kerrigan Iron Works APWA booth. Miss Sonny Hamilton looks on.

"Neither snow nor rain"—nor Hurricane Edna—stayed this Dempster Dumpster from "the swift completion of its appointed rounds" in New York in September as it plowed its way through rising water on East River streets in a 4-inch downpour.

One of the great engineering feats along the new West Virginia Turnpike: Four-mile Fork bridge which motorists cross upon emerging from half-mile long "Memorial Tunnel". Bridge is 278 feet high, 1230 feet long. Turnpike is 88 miles long.

For the LOW BID on any job, figure your costs with BARCO



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WORTH TELLING

by Arthur K. Akers

★ MERRY CHRISTMAS to all! And if it's early, remember that the exigencies of publication schedules dictate the timing, so that our good wishes will but be with you the longer. The New Year looks so bright from where we sit, and where we have been, that we are reserving a special spot for *those* greetings, next month.

★ AMES, Iowa, and its mayor, Joe Lawlor, keep getting into the news. This time with "Tank Linings, Inc.," latest offspring of General Filter Co., with Koroseal linings applied to tanks.

★ PORTLAND CEMENT ASSOCIATION'S eastern regional office—one of 29—has moved to 230 Park Avenue, New York.

★ BYRON JACKSON COMPANY, pumps, Los Angeles, has its expanded public relations and advertising department now headed by Ross Barrett. The Welcome mat is herewith dusted off!

★ RADIATOR SPECIALTY COMPANY, makers of those highly useful rubber traffic cones, will have its new Charlotte (N. C.) factory addition in operation by next month, their advertising manager, George Einhart, told us on our recent visit there.

★ MARION POWER SHOVEL COMPANY and its subsidiary the Osgood Company have been acquired by Merritt-Chapman & Scott Corporation.

★ BLAW-KNOX Company, Pittsburgh 30, has a very beautiful new 50-page brochure, "This is Blaw-Knox," that is yours for the asking.

★ CAST IRON PRESSURE PIPE INSTITUTE, Sidney E. Linderman, executive vice chairman, moves to 425 13th Street NW in Washington.

★ SOUTHWESTERN PLASTIC PIPE COMPANY, Mineral Wells Texas, a subsidiary of Texas Vitrified Pipe Company, started construction in November on their new plastic pipe plant, Ferris Bailey, general manager, announces.

★ AMERICAN CONCRETE PIPE ASSOCIATION will hold its 47th annual convention at the Sheraton-Plaza, Boston, March 9-12, 1955.

★ JOHN F .MARTYR is now sales manager and partner, Diamond Tool Associates (core drills), Hawthorne, Calif. He was formerly with Felker Manufacturing Company.

Mr. Schleeweis

★ JOHNSTON PUMP COMPANY, Pasadena, announces Charles J. Schleeweis as sales manager, as part of a general expansion program. He was previously manager of Johnston's export sales and will now have charge of both domestic and export sales of vertical turbine pumps.

★ ARMCO DRAINAGE AND METAL PRODUCTS Inc. announce a major expansion, into the field of prefabricated steel buildings. D. H. Malcolm heads the new department. And our hat is off to Armco's hospitality suite at the F.S.I.W.A. meeting in Cincinnati in October. They saved the life of a leading Columbus citizen in our company.

★ KAIGHIN & HUGHES, Toledo, form a new Industrial Wastes Division, under Edmund B. Besselievre, long chief of Dorr Company's International Sanitary Engineering Division.

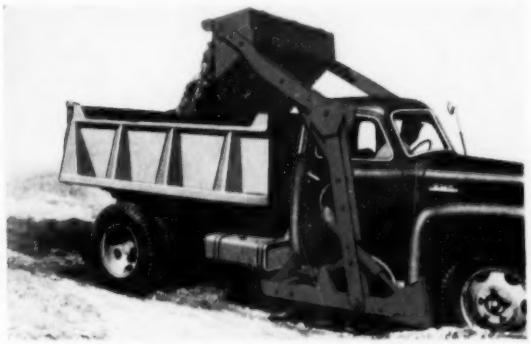
★ ARTHUR T. McWANE, until recently president of McWane Cast Iron Pipe Company, Birmingham, passed away in September after a brief illness.

★ SIGN on a Negro detective agency's window in Birmingham: "Crooks caught. We smells 'em out while others still sniffs about."

HOLMES-OWEN TRUCK LOADER provides worthwhile savings on such jobs as repaving, repairs and maintenance of streets, roads, parks, etc.

. . . . Invaluable as a WORK-SAVER on STREETS, ROADS and Numerous other operations

VERSATILE ONE MAN USE reduces cost of street cleaning, removal of debris, broken pavement, snow, hard deposits of washed-in dirt, trash, etc.



LOADER enables Truck Driver to speed-up loading and hauling of materials, thereby offering substantial savings in cost per ton handled.

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Cities throughout the nation are today reducing the cost of street maintenance, handling of stockpile materials and many other operations with trucks that are equipped with a HOLMES-OWEN LOADER. The use of a truck loader speeds up hauling and loading, thereby assuring faster, more efficient work. It saves time, labor and equipment by permitting the truck driver to do light digging, grading, cleaning up and loading, without the need of additional manpower or the use of more costly equipment. A truck with such versatile one-man operation can easily do the work of several men, and as such, becomes a valuable asset in reducing today's high cost of operations.

The HOLMES-OWEN LOADER is hydraulically operated, lifts ½ yard per bucket, loads the average truck in 4 minutes and can be installed on most any 1½ to 2 Ton Truck. For full information see your equipment dealer or write factory direct.

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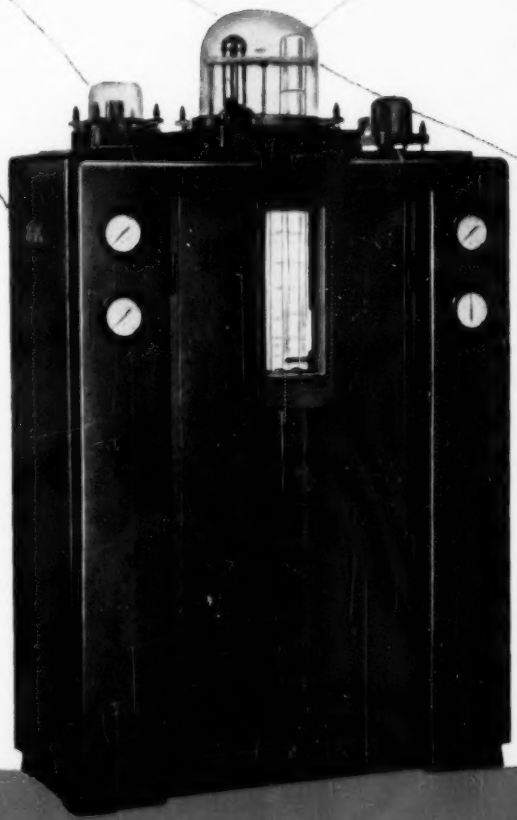
If, by nature, you're skeptical, you can easily prove it to yourself by passing along your own particular chlorinator problem. You'll hear from us promptly — and without obligation, of course.

S-84



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